Factors Underlying Gaming Machine Play

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Statement

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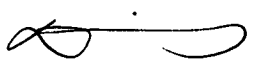

Anna Dimsey, October 2007.

Abstract

Gambling addiction has often been associated with fast cycle games such as gaming machines rather than slow cycle games like lotteries. Unlike other forms of gambling, gaming machines allow almost continuous play, and therefore the factors that underlie problem gambling associated with gaming machines may differ from other forms. This thesis examines differences between problem gamblers and regular gamblers whose predominant form of gambling is gaming machines, as well as a matched control sample of non-gamblers. This study had two main aims; to identify motivational and personality constructs useful in understanding the development and maintenance of problem gambling, and to explore different dimensions of gamblers.

A package of questionnaires, including the South Oaks Gambling Screen (SOGS), was completed by 141 volunteers recruited from gambling treatment agencies and the general community. Three groups were formed (problem, regular and non-gamblers) on the basis of SOGS score, in conjunction with self-report measures of gambling behaviour.

In line with the first aim the first part of this study explored the differences between regular, problem and non-gambling groups from a reversal theory perspective and also to examine differences between these groups on personality variables previously associated with problem gambling. Analysis was conducted using results from the Telic Dominance Scale, Motivational Style Profile, Zuckerman Kohlman Personality Questionnaire and the I7 (impulsivity questionnaire). It was hypothesized that problem and regular gambling groups would be more paratelic dominant than non-gamblers and that problem gamblers would be more mastery oriented, negativistic and pessimistic than regular or non-gamblers. In line with these hypotheses it was found that regular gamblers scored

more highly on *playfulness* than problem and non-gamblers; however, neither gambling group was found to be more paratelic dominant than the non-gambling group. As hypothesized, problem gamblers were higher on *pessimism* than the other two groups. Problem and regular gamblers were found to score more highly on *impulsiveness* and *aggression/hostility* than non-gamblers. Problem gamblers also scored more highly on n*euroticism/anxiety* than regular gamblers, who also scored more highly than non-gamblers on this measure.

In order to explore the second aim of the study, exploratory factor analyses were performed to examine the presence of different dimensions of gamblers. Data from the regular and problem gambling groups was analysed. A three-factor solution was found to provide the best fit for the data and supported Blaszczynksi and Nower's (2002) proposed pathways model for problem gambling. The first factor had characteristics that correspond well with the impulsive type subgroup or *biological correlates* group described by Blaszczynski and Nower, with individuals in this group displaying higher levels of impulsivity and sensation seeking. The second factor corresponded most closely to Blaszczynski and Nower's *normal* problem gambling subgroup, made up of individuals who gamble but show little psychopathology. The third factor corresponded to the *emotional* subgroup, with higher levels of negative mood states such as pessimism and anxiety present, as well as impulsivity but not sensation seeking or venturesomeness. These results are discussed in terms of reversal theory constructs and implications for treatment of gambling addiction.

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Introduction and Overview of the Thesis

Recently in Australia there has been an increase in the number of different forms of gambling readily accessible to the community. With this expansion there has been a shift in beliefs and expectations of the community in regard to gambling. In the past gambling was seen as a positive cultural and social event, with monies raised often used for community purposes (Williams, 1996). With the increase in technology and privatisation of gambling, profits no longer flow to the communities where it occurs, and gambling is now seen as having greater social and economic costs to communities, which outweigh any benefits it may provide (McMillen, 1997).

In the period between 1997 and 1998, 40% of Australians could be considered regular gamblers, 5.7% considered they had slight problems with their gambling and 2.1% of Australian adults were classified as experiencing moderate to severe problems with gambling (Productivity Commission, 1999). Electronic gaming machines (EGMs) have been implicated in a rise in problem gambling in Australia with it being suggested that people become addicted to playing EGMs faster than other forms of gambling (Breen & Zimmerman, 2002; Dowling, Smith & Trang, 2005). There has also been an increase in the number of females experiencing problems with gambling, possibly due to the increased accessibility and acceptability of this form of gambling for females (Productivity Commission, 1999).

There have been a number of theories applied to gambling behaviour, and more specifically to the development of problem gambling. Gambling has often been associated with sensation seeking and arousal (Anderson & Brown, 1984;

Lesieur, 1984), although findings in relation to these components in gambling samples have been mixed. Dickerson (1993) points out that gambling is not a unitary or homogenous activity, therefore there are likely to be different motivations for play according to the type of game.

The aim of this thesis was to examine the role of reversal theory in providing an explanation for electronic gaming machine play, as well as determining personality characteristics that may differentiate between non-gamblers, regular gamblers and problem gamblers. Furthermore this thesis aimed to explore the possibility for there to be distinct subgroups of problem gamblers.

The literature review provides an overview of gambling including the definitions, diagnosis and prevalence of gambling in Australia. It also provides an outline of the different theories that have been applied to gambling behaviour, including the application of reversal theory to gambling.

The empirical study examines the role of reversal theory in understanding gambling behaviour and investigates personality variables associated with gambling behaviour, in particular the role of impulsivity and sensation seeking. The empirical study also covers the investigation of different dimensions of the gambling groups, which potentially may represent different subgroups of gaming machine players. Finally this thesis covers a review of the findings of the empirical study and the implications these may have for the theoretical understanding of gambling behaviour and for the design of clinical psychological treatment approaches for problem gambling.

Literature Review

An Overview of Gambling

The term gambling derives from a word meaning play or sport (Wykes, 1964). Gambling in its current form includes the additional component of money or valuables to what we would normally consider play or sport and may be better defined as "the making of a contract between two parties which determines the exchange of money, goods or services depending on the outcome of an uncertain event in the near future" (Brown, 1991, p. 103). Gambling today also includes many different and varied activities, from betting at the track to financial speculation.

Generally gambling is split into two main forms; wagering and gaming. Wagering describes all activities commonly known as betting and includes any wager made on races and sporting events (either at the track or betting agency, over the phone or on the internet). Gaming is the term used to describe any other gambling activity such as casino table games and gaming machines. Lottery products and keno are often included in the gaming category although it has been suggested that these should form a separate category known as minor gaming (Productivity Commission, 1999). Minor gaming also would include bingo and raffles, activities generally not considered by the majority of the population as gambling.

In comparison to other countries, Williams (1996) suggests that gambling in Australia has been seen in a more positive light, as a major component of Australian culture and as a social benefit to those involved. This positive perception of gambling in Australia has been attributed to a number of factors,

including the use of gambling as a social event in isolated areas, gambling as a revenue raiser for charitable organisations, and legalisation and state ownership of gambling with its perceived community benefits.

Recently in Australia gambling has been seen in a more negative light, possibly due to the breakdown of these earlier perceived benefits and the rapid expansion of the industry. Gambling no longer fulfils a social role in isolated areas as improvements have been made with better access to transport and communication technology. Privatisation of gambling has also meant that profits no longer flow directly to the community, and gambling is now portrayed as an industry that creates social and economic costs to the community (McMillen, 1997). Community organisations suggest that monies raised by gambling activities today, such as raffles and bingo, are much less. This is because the percentage of money spent on gambling by the community is now split between community fundraising activities and privately owned gambling activities (Productivity Commission, 1999).

Rapid expansion of gambling in Australia has led to an increase in the types of gambling readily available to the public. It is suggested that increases in various forms of gambling as well as the accessibility and social acceptance of such forms, has led to increases in the number and type of individuals who will experience difficulties with controlling their gambling behaviour (Productivity Commission, 1999).

Features of different forms of gambling

Gambling is not a unitary or homogenous activity (Dickerson, 1993). Each form of gambling may differ on a number of dimensions, possibly altering its appeal to different individuals who play. Wildman (1998) outlines a number of

these possible dimensions, shown in Table 1, which include games of skill versus chance, random versus non-random results, odds of success and variance of the odds. These factors are important to consider when determining individual characteristics and motivations of those who gamble.

It is known that certain dimensions of gambling make it more or less likely that individuals will experience problematic play. The majority of gambling activities involve random and independent outcomes, however more problematic gamblers are likely to try to enforce some sort of strategy during play to try to provide meaning to the outcome. Physiological arousal is also an important element in gambling with the rate of feedback playing an important role in increasing physiological arousal. Types of gambling where feedback is immediate (or rapid) such as betting on races or playing gaming machines have been referred to as "hot" games versus "cold" games such as lottery where rewards are delayed. These differing rates of play may also be considered fast-cycle (short period between action and outcome) and slow-cycle (long period between action and outcome) and have an impact on the level of arousal felt by players. Gambling addiction has been associated more frequently with fast cycle versus slow cycle play (Wildman, 1998), as consistent arousal whilst gambling (such as found with rapid feedback) has been hypothesized to act as an additional reinforcer along with a variable reinforcement schedule (Coventry & Brown, 1993).

Table 1

Dimensions of Gambling (adapted from Wildman, 1998)

Gambling Dimension	Relevant Properties
Type of Game	Random and independent (e.g. electronic gaming machines, EGMs) Random but non-independent (e.g. Blackjack) Non-random and non-independent (e.g. sports)
Immediacy of feedback results	Immediate (e.g. EGMs) Delayed (e.g. lotto)
Skill level of play	Skillful (e.g. poker) Lacking in skill (e.g. EGMs)
Expected value = payoff x probability of winning / ticket price	Negative expected value Zero expected value Positive expected value
Odds of success	High Medium Low
Variance of odds	High Medium Low
Amount wagered	Possessing marginal fractional utility (a sum of money important to the person making the wager) Lacking in marginal fractional utility (a sum of money unimportant to the individual making the wager)

Electronic Gaming Machines (EGMs)

EGMs have evolved since Charles Fey designed the three-reel slot machine in 1899. Sharpe, Walker, Coughlan, Enersen, and Blaszczynski (2005) outline a number of the technological advances that have occurred since then including the introduction of virtual computerized reels, the option to play multiple lines and credits, free-spin and double-up features. In even more recent times EGM technology has advanced rapidly. According to Sharpe et al., some of the results of these advances in technology are machines that accept larger bet sizes and allow *continuous play* with five seconds being the average time between games marked by button presses on Australian EGMs.

EGMs have been called the "crack cocaine" of gambling (Dowling et al., 2005), referring to their speed and rate of play, their ability to increase arousal and the immediate gratification they provide. Dowling et al. have also suggested that people playing gaming machines are likely to become *addicted* faster than to any other form of gambling.

Breen and Zimmerman (2002) also found that problem gamblers who primarily play gaming machines had a significantly shorter latency of onset of problem gambling than did "traditional" problem gamblers. These authors found that on average gaming machine players developed problems in 1.08 years whereas those who engaged in other forms of gambling developed problems in 3.58 years. Importantly this study also looked at interpersonal factors thought to increase latency of onset of problem gambling, finding that gender, comorbid substance use disorders or depressive disorders were not associated with latency of problem gambling onset. Breen and Zimmerman concluded that rather than interpersonal variables, the social, environmental, and stimulus features of

mechanized gambling were implicated in problem gambling onset latency. However, it is also clear that not all individuals who play gaming machines will go on to develop a gambling problem; rather, in susceptible gamblers, problem gambling will occur more quickly than with other forms of gambling.

Currently in Australia the gender balance of problem gamblers is roughly equal (Productivity Commission, 1999). This is very different from the findings of Dickerson (1991) that 86% of problem gamblers in Australia were male. In the time period between these two reports the widespread introduction of EGMs has occurred. The Productivity Commission (1999) suggests that gaming machines have been in part responsible for the increase in female gamblers due to accessibility and acceptability of this form of gambling for women.

The report of the Productivity Commission (1999) presents findings showing that 85% of females who are receiving counselling for problem gambling report that their difficulties relate to playing gaming machines. Male gamblers in counselling also predominantly reported gaming machines as the source of their problem (54%) but a percentage also experienced problems with racing (27.8%) and casino table games (8.5%).

Definitions and Diagnoses of People Who Gamble

A number of different definitions are used for individuals who gamble and persons who gamble problematically. This section outlines commonly used terminology as well as providing information on the diagnostic category of problem gambling.

Social Gambling

Social gambling has been defined as gambling that "typically occurs with friends or colleagues and lasts for a limited period of time with predetermined acceptable losses" (American Psychiatric Association [APA], 2000, p.673). According to the Productivity Commission (1999) 82% of Australian adults participated in gambling activities between 1997-1998 (not including raffles or sweeps), 40% of adults could be considered regular gamblers participating more than once per week, but only 20% of these are regular non-lottery gamblers. For some individuals gambling can be considered more than a casual entertainment activity with predetermined set losses. This is indicated by the fact that 10% of gamblers accounted for 70% of the total gambling expenditure in Australia during the 1997-1998 financial year, indicating problematic gambling.

Problem Gambling

Problem gambling is an inclusive term used to describe gambling behaviour that is problematic, but that does not necessarily meet the diagnostic criteria for Pathological Gambling (Productivity Commission, 1999). Definitions of Problem Gambling generally include the notion of harm as a consequence of gambling behaviour, to the individual, the family, or the community. It may be difficult to separate individuals who gamble into problem and non-problem gamblers and for this reason gambling is often seen as a continuum, with social gambling at one end of the scale and pathological gambling at the other. This approach to gambling recognises the individual as the person best able to determine the impacts of gambling and best able to recognise the detrimental impacts that gambling may be having on his or her life. Many researchers also

agree that this definition is more acceptable since it does not have to rely on underlying pathology to identify gambling problems.

The most recent Productivity Commission Report (1999) estimated that during the 1997-1998 financial year, 2.1% of Australian adults had problems with gambling; of these 1% are estimated to have severe problems, the other 1.1% experiencing moderate problems. Additionally, 5.7% of respondents in the Productivity Commission enquiry indicated they considered they had slight problems with gambling.

It is also important to consider the impact of gambling on non-gamblers; that is, the number of people indirectly affected by a problem gambler's behaviour. This figure is estimated to be in the range of 5-10 people for every single gambler, as well as additional impacts on community services (Productivity Commission, 1999).

Pathological Gambling

Pathological Gambling has been classified as an impulse-control disorder in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV, APA, 1994). The DSM-IV suggests that the lifetime prevalence rate of pathological gambling is likely to be in the range of 0.4% to 3.4% in adults, with higher rates likely in some areas including Australia.

The essential feature of an impulse-control disorder is the failure to resist the temptation or impulse to perform an act that is harmful to the person or to others. This category includes disorders such as kleptomania, pyromania and intermittent explosive disorder. In order to meet the DSM-IV criteria for pathological gambling individuals must engage in persistent or maladaptive gambling behaviour. This may be indicated by a number of factors, such as

preoccupation with gambling, unsuccessful attempts to control gambling (during which the individual may experience restlessness or irritability), lying about gambling behaviour, and chasing losses.

Some researchers have questioned the inclusion of pathological gambling with the impulse control disorders. There appear to be a number of discrepancies between pathological gambling and other impulse control disorders, in particular the emotional aspects of the experience. For example, Shaffer, Hall, and Vander Bilt (1999) state that pathological gamblers do not feel distress until after gambling is terminated whereas for other impulse control disorders the acts are not pleasant experiences and instead provide the individual with feelings of relief after the act.

In both clinical and research literature, pathological gambling is rarely compared and contrasted with other impulse control disorders but is more commonly found in literature on addiction, in particular drug and alcohol abuse and dependence, both of which involve problems in impulse control. The DSM-IV criteria for pathological gambling also reflects an association with addictive disorders, with 5 out of the 10 criteria directly related to those found in substance abuse categories. Pathological gambling appears in the World Health Organisation ICD-10 (2006) as an impulse control disorder but with similar features as other addictive behaviours.

Compulsive gambling is a popular term used often by Gamblers Anonymous and is also used interchangeably with pathological gambling. However, the term compulsive gambling is not used widely in the gambling literature today, and Lesieur and Rosenthal (1991) suggested that the term is a misnomer since most compulsive gamblers enjoy gambling, particularly in the

early stages. Although some authors have suggested links between gambling and the obsessive-compulsive spectrum disorders, Moreya, Ibanez, Liebowitz, Saiz-Ruiz, and Blanco (2002) observe that gamblers do not display the increase in harm avoidance, risk aversion or anticipatory anxiety that characterize compulsive behaviours.

Theories of Gambling Behaviour

As rates of gambling have grown and awareness of problem gambling has increased there has been a move towards developing theoretical models to understand gambling behaviour. Most theoretical models attempt to explain problem gambling behaviour rather than non-problematic gambling behaviour (Blaszczynski & Nower, 2002). The following section outlines the main theoretical approaches that have been developed as an attempt to understand both problem and non-problem gambling behaviour.

Psychodynamic Approaches

The earliest models of problem gambling developed from the psychoanalytic approach. Freud (1928, cited in Wildman, 1998) analysed the personality of Dostoevsky, a notorious gambler, concluding that gambling could be considered the result of unresolved Oedipal conflicts. Freud noted that there was a relationship between gambling and compulsive neurotic states with a prominence of guilt and depression related to early parental interaction. Herman (1976) retrospectively examined the Dostoevsky case and noted that Dostoevsky's wife believed that his gambling was related to a need to resolve unpleasant mood states, related to the early death of his father. Bergler (1957) proposed that gamblers have a desire to lose, thereby punishing themselves, a need set up by

unconscious aggressive impulses against the father figure. Of interest, Bergler also noted that gamblers appear to seek a sensation level, sensation or mood that seems more important than winning itself.

Psychodynamic approaches however run into difficulties due to their inability to provide evidence to either support or refute their theoretical perspective. Walker (1992) raises this objection, suggesting that the difficulty in drawing such conclusions is due to the subjective nature of the constructs. Also evident is the failure of the psychodynamic approaches to consider social, cultural and environmental factors and their influence on gambling behaviour.

Biological Approaches

One approach that has been taken in understanding gambling behaviour is to look at the neurobiology and neurophysiology of individuals who gamble. There is a growing body of literature to support this approach that looks at the role of genetic and biological factors in understanding pathological gambling (Ibanez, Blanco, & Saiz-Ruiz, 2002).

Serotonergic pathways have been implicated in pathological gambling, linking this disorder to other impulse control disorders, as low levels of serotonin metabolites in cerebrospinal fluid are believed to be a biological correlate of impulsivity (Brown & Linnoila, 1990). A study by Moreno, Saiz-Ruiz and Lopez-Ibor (1991) suggested that male pathological gamblers have decreased serotonin synaptic activity compared to controls. Serotonergic, nonadrenergic and dopaminergic dysfunction have all been reported as factors contributing to pathological gambling (Ibanez, Blanco, Castro, Fernandez-Piqueras, & Saiz Ruiz, 2003), with each of these neurotransmitters playing a role in the mechanisms involved in reward, initiation, disinhibition, and arousal. However, as discussed

in Ibanez et al. (2002), inconsistencies have been found between studies investigating these neurotransmitter systems, with some studies finding no difference between pathological gamblers and controls, others finding that pathways affected are influenced by the sex of the participant.

Bechara (2003) compared patients who had sustained damage to the ventromedial sector of the prefrontal cortex with substance dependant individuals in whom abnormalities of the orbitofrontal cortex have been noted. Both these groups showed similar behaviours: denying or being unaware of a problem, and a preference for choosing immediate rewards and ignoring future consequences. Bechara found three subgroups of substance dependant individuals: one group showing impairment in decision making most likely due to hypersensitivity to reward; one group with an impairment in decision making more consistent with insensitivity to future consequences; and a normal sub-group who did not show any impairment within the paradigm used in this experiment. Furthermore, Bechara highlights the importance of using studies of substance dependence as models for pathological gambling research, suggesting it represents a similar addictive disorder without the confounding of drug effects on the brain.

The difficulty with such biological approaches is the tendency for the focus to be on problem gamblers, without an adequate explanation provided for non-problem gambling. Additionally these theories are unable to account fully for the development of problem gambling shown to occur in individuals who previously gambled without any problems.

Socialisation/ Social Learning Theory

Social Learning theory/Socialisation theory postulates that gambling is a learned activity and as Rosecrance (1986) points out, one that carries with it

important social implications. Gambling may be used as a social activity, whereby participants need to continue with gambling even whilst losing or risk being socially isolated (Wildman, 1998).

Social learning models of gambling behaviour look at gambling along a continuum of non-problem to problem gambling, and suggest that gamblers do not necessarily progress through set stages from non-problem to problem behaviour (Brown, 1987, 1988). Social learning theories often incorporate other theoretical approaches thus also allowing for gambling to change from an event performed purely as a social activity to an event that is serving some other adaptive function (Wildman, 1998). Criticisms of social learning models include the underestimation of important individual factors such as emotion, motivation and perceptions and an overestimation of the influence of external social factors (Ferris, Wynne, & Single, 1999). Social learning theories also tend to focus on the non-clinical end of the gambling behaviours spectrum, which has been considered both a strength and weakness. In support of this focus is the lack of an artificial distinction between types of gamblers (Ferris et al., 1999). However, Brown (1987) criticises such theories as not adequately exploring the clinical end of the gambling spectrum.

Behavioural Models

Knapp (1976) comments on the importance of intermittent reinforcement in making gambling resistant to extinction. Looking from a perspective of classical and operant conditioning, gambling has been demonstrated to produce a state of subjective excitement (Dickerson, Hinchy, & Fabre, 1987) as well as increased heart rate (Anderson & Brown, 1984). A number of different reinforcers have been postulated to influence gambling behaviour; the payout after

a win, the physical reinforcer of excitement or relief (Brown, 1986) or the chains of behaviour itself (McConaghy, Armstrong, Blaszczynski, & Allcock, 1988). Repeated pairings condition this arousal to stimuli associated with the gambling environment, and through second order conditioning such cues elicit an urge to gamble, resulting in a habitual pattern of gambling behaviour (Ferris et al., 1999).

Wildman (1998) counters this argument by pointing out that only some individuals become 'hooked' on gambling, suggesting that a consideration of individual differences is also required. Cognitive schemas that develop as a result of early and repeated wins may also be important in producing irrational beliefs that promote gambling as an effective way of winning money (Blaszczynski & Nower, 2002).

Cognitive Theories

The importance of cognitive factors in maintaining gambling behaviour has been demonstrated in a number of studies (Gilovich, 1983; Griffiths, 1993, 1994). Wildman (1998) concludes, "irrational thinking, in the form of expressed belief in the illusory control over devices involved in games of chance, is a common accompaniment of gambling" (p. 57). It has been suggested that such cognitions fulfil two purposes; an increased memory of wins and decreased memory of losses, as well as an ability to maintain confidence in decision making despite losses.

Griffiths (1993) reports that regular players of fruit machines believe their actions to be skilful and that pathological gamblers have a greater skill orientation than other less regular players. Sharpe (2002) also found that gamblers display irrational cognitions and conclude that these are fundamental to the instigation and maintenance of gambling. Griffiths and Delfabbro (2001) however, suggest that

cognitive theories of gambling behaviour have a number of difficulties, as similar observations of irrational cognitions whilst gambling have been found in students with no gambling experience.

A combination of both behavioural and cognitive models allows for greater explanation of both problem and non-problem gambling. The physical reinforcement of the gambling behaviour combined with erroneous perceptions of chance increase the likelihood the gambler will return again, or keep playing despite a series of losses (Ferris et al., 1999). Furthermore, those individuals who experience problems with their gambling may be more sensitive to physical reinforcers of arousal.

Physiological arousal based theories

The role of arousal in gambling behaviour has been explored in a number of studies. Lesieur (1984) commented "everyone who gambles is embroiled in a desire for action" (p. 23). Physiological evidence of increased arousal during gambling has also been found in some cases (Anderson & Brown, 1984), although other studies have failed to find this increase (e.g., Rule & Fisher, 1970). Many of the theories put forward to explain gambling behaviour have included some focus on levels of arousal, which has led to gambling being linked to both sensation seeking and impulsivity.

Evidence for the presence of high levels of impulsivity in samples of gamblers has been mixed, with both higher and lower levels of impulsivity found in samples of problem gamblers compared to the general population (Allcock & Grace, 1988; Breen & Zuckerman, 1999; Coventry & Brown, 1993). Moore and Ohtsuka (1997) noted that venturesomeness and impulsivity were differentially associated with risk-taking and trying new activities, finding that problem

gambling was associated with higher levels of impulsivity and low levels of venturesomeness. According to Eysenck and Eysenck (1991), venturesomeness can be considered "true" impulsivity. It is related to extroversion and impulsiveness as the pathological aspect of risk-taking and is related to antisocial attitudes. Clarke (2004) suggests that the personality traits of impulsiveness and venturesomeness should therefore be considered separately when looking at sensation seeking in relation to problem gambling. Petry (2001) also points to the multi-factor nature of sensation seeking as a possible cause of discrepancies in findings related to this construct and problem gambling.

Theoretical approaches to gambling are often based on findings of increased arousal common in other addictive behaviours. Of particular note is Jacobs' (1986, 1989) general theory of addictions, which includes the role of arousal mechanisms in the development of addictive behaviours. Jacobs proposes that for addictions to develop, two main factors need to be present; first a physiological arousal that is perceived as chronically hypertensive (over aroused) or hypotensive (under aroused), and second, predispositions due to childhood experiences, marked by feelings of inadequacy, rejection and inferiority. In the case of gambling, it is suggested that individuals are chronically hypotensive, with gambling providing the means to increase arousal and provide relief from psychological distress. In support of Jacobs' assumptions, some individuals who gamble have been found to have higher rates of depression (Blaszczynski & McConaghy, 1988) and anxiety (Blaszczynski & McConaghy, 1989). Links between gambling, impulsivity and sensation seeking have also been noted by Anderson and Brown (1987).

Jacobs' theory (1986; 1989) ties in with the optimal arousal view of Hebb (1955, cited in Apter, 2001), where positions at either end of the arousal scale will be experienced as unpleasant (low arousal will lead to boredom, high arousal to anxiety). There are, however, a number of difficulties with optimal arousal theory, in particular the difficulties it faces when trying to accommodate reported pleasant feelings associated with both excitement and relaxation. One theory that seems to overcome these difficulties is reversal theory (Apter, 1982).

Reversal Theory

Reversal theory is a general psychological theory of motivation and emotion, which has been applied to a diverse range of behaviours including addiction generally (Apter, 1989), and more specifically gambling (Anderson & Brown, 1987; Apter, 2001). In contrast to optimal arousal theory, reversal theory proposes that there are opposite ways of experiencing arousal (metamotivational states) that allow for both high and low felt arousal to be experienced as pleasant and unpleasant (e.g. high arousal as excitement or anxiety, low arousal as relaxation or boredom).

Reversal theory outlines four pairs of states that form eight distinct metamotivational modes, corresponding to 16 felt emotions. Each of these pairs corresponds to a particular domain of everyday experience (see Figure 1). These pairs of states are opposite ways of interacting within each domain that are mutually exclusive, however switches or reversals may occur between them (Apter, 2001).

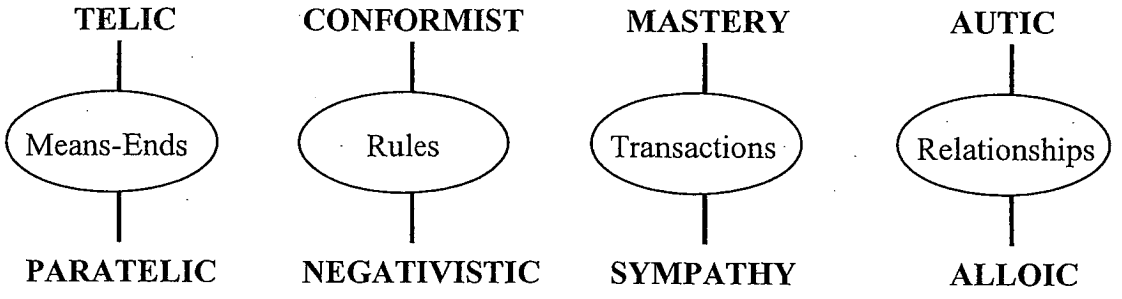


Figure 1. Reversal Theory's four domains and corresponding metamotivational states (adapted from the Reversal Theory Website).

The first two pairs of states; telic/paratelic and conformist/negativistic are referred to as the somatic states because they both refer to the experiences of felt arousal (see Figure 2). The telic/paratelic pair is also often referred to as the arousal avoiding/arousal seeking pair. In a telic state behaviour is goal oriented, high arousal is experienced as unpleasant (i.e., anxiety) and low arousal is experienced as pleasant (i.e., relaxation). In contrast the paratelic state is present oriented. High arousal is experienced as pleasant (i.e., excitement) and low arousal as unpleasant (i.e., boredom). The negativistic/conformist pair make up the other two somatic states and are concerned with the way people respond to rules, expectations and demands. In a conformist state one is inclined to cooperate and abide by the expectations of others and conform to the rules. The negativistic state however, is one in which people will tend to break rules and act defiantly.

The other four metamotivational states make up what are known as the transactional states, as in these states experiences are mediated by the way one perceives interactions with one's self and others (see Figure 3). In the mastery

state interactions are evaluated by one's perception of winning or losing, or feelings of control and dominance. In the sympathy state emotions such as giving and caring are prominent. The second pair of states refer to whether one is self-focused (autic) or other-focused (alloic) and are considered in conjunction with the mastery/sympathy pair, giving a combination of 6 states rather than 4.

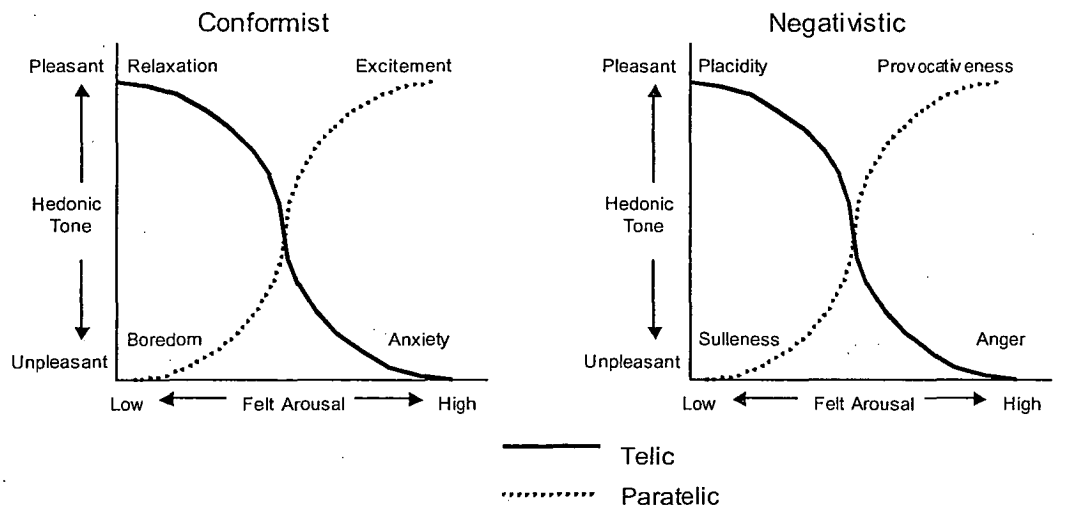


Figure 2. Relationship between felt arousal and hedonic tone for each of the somatic states (from Frey, 1997; 1999).

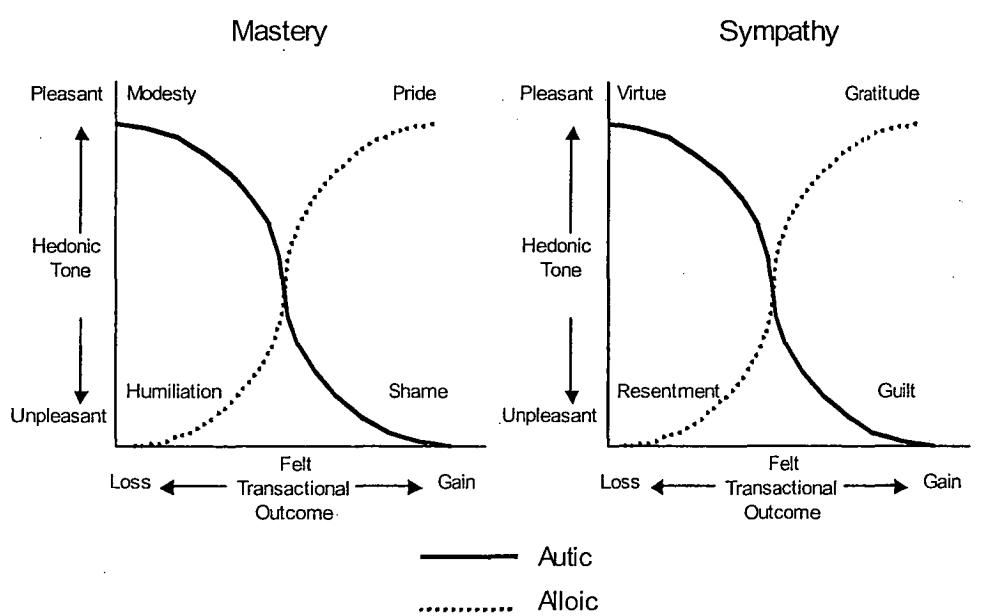


Figure 3. The relationship between felt transactional outcome and hedonic tone for each of the transactional states (from Frey, 1997; 1999).

Reversal theory proposes that individuals experience one state from each of the four pairs at any given moment. Switches between states are known as reversals (Apter, 2001). Although reversal theory hypothesises that individuals switch between combinations of states, it also acknowledges that people have dominant metamotivational states (Apter, 2001) that they are more likely to experience the majority of the time. Apter also suggests that individuals have more salient states, that is, states whose corresponding emotions and values are more highly regarded.

Apter (2001) outlines various types of state dominance. It is proposed that individuals are born with a tendency towards particular states, this being known as their constitutional dominance. State balance refers to the amount of time one spends in a particular state and may be considered across different situations (dominance) or across specific situations (situational dominance).

One of the main features of reversal theory is an emphasis on states rather than traits. As outlined above, reversal theory postulates that every psychological need has an opposite need, (for example serious achievement versus fun and immediate enjoyment) and that individuals need to satisfy these alternative needs at different times. This allows for inconsistencies in the way people behave in a given situation, and in fact these variations, or reversals, are necessary for normal and healthy psychological adjustment (Apter, Mallows, & Williams, 1998).

The need to alternate between various psychological states has been suggested as a factor in the development of a number of psychological problems. Individuals may be seen as having trouble reversing between states or as experiencing reversals in inappropriate situations, for example, anxiety due to an

inability to reverse to the paratelic state or an inappropriate reversal from a paratelic to a telic state during a social situation leading to social anxiety.

Reversal Theory and Gambling

Reversal theory appears to be able to explain the mechanisms underlying behaviours classified as addictive, by suggesting that addictions are used as a means of reversing to a preferred state (Miller, 1985). Brown (1988, 1991) also suggests that addictions may be used in order to sustain a high level of hedonic tone, either through manipulating arousal level, or manipulating motivational state. An addiction may represent a reliable method of manipulating hedonic tone, particularly for individuals with limited access to other means of reversal. This fits with the findings of McCorriston (1999) who suggests that individuals partake in addictive behaviours to meet specific needs, and also Jacobs (1988) who stated, "addictive patterns of behaviour may be conceptualised as a form of self-management or self-treatment" (p. 28).

Problem gambling is often linked to other psychological disorders such as depression, anxiety and substance abuse (Crockford & el-Guebaly, 1998; Lesieur, Blume, & Zoppa, 1986). It is suggested that individuals who experience problems with gambling may have difficulties in maintaining and achieving their preferred metamotivational state. These individuals are likely to become adept at using gambling in order to reverse to their preferred state of arousal, for which they have found few other means which are as reliable. As gambling continues it is likely that other strategies that may have been successful in the past to manipulate arousal will become unavailable or ineffective, leading to an increased reliance on gambling to alleviate unpleasant emotional states. For example, social activities

which may have produced reversals, are now no longer available due to lack of money or social contacts.

The gambling environment satisfies most of the requirements for reversals to the paratelic state to occur, with play containing powerful state inducing and maintaining cues (Brown, 2001). Rules and structure of the gambling environment provide a protective frame, allowing for reversal to the paratelic mode to be experienced. Uncertainty and arousal inducing elements allow for the individual already in a paratelic state to change from boredom to excitement or for the individual in the telic state to reverse to the paratelic state and re-experience high arousal as enjoyable (Brown, 2001).

During gambling it is likely that the gambler will experience alterations in their metamotivational state, with switches occurring between the paratelic and telic state depending on conditions of play. Some alterations in metamotivational state are likely to determine whether the gambler persists when losing (Anderson & Brown, 1987). Changes in metamotivational state for the problem gambler are likely to affect gambling behaviour differently compared to non-problem gamblers for the following reasons. Firstly, as it is hypothesised that problem gamblers have few alternative means of changing their arousal or their state to relieve unpleasant emotions, they are therefore likely to continue to play whilst losing in order to experience the positives of reversal when winning again (Brown, 1989). Also, it has been demonstrated that problem gamblers report altered cognitions surrounding the chances of winning, believing either that continued play or some element of skill is involved in order to win. This may lead to gambling becoming a telic activity as gambling then becomes a goal directed behaviour.

Elements of dissociation that have been linked to problem gambling behaviour (Jacobs, 1988) can also be integrated into the reversal theory explanation of problem gambling. Gambling is believed to produce changes in emotion or metamotivational state through raising levels of arousal. The high levels of arousal produced may lead to a narrowing of attention or dissociation for the individual allowing escape from unpleasant mood states. The ritualistic behaviours that are associated with providing a protective frame allowing for reversal to the paratelic state to occur, are also likely to produce dissociation (Brown, 2001). The combination of narrowed attention, ritualistic behaviour and paratelic state may provide relief from unpleasant dysphoric emotions felt prior to gambling.

Reversal Theory has shown promise in aiding the understanding and implementation of smoking cessation (O'Connell, Gerkovich, & Cook, 1995; O'Connell & Martin, 1987). It seems likely that this theory will be able to provide important insights into effective therapies for aiding the problem gambler. It has been suggested by a number of researchers that gambling is used to fulfil certain needs (McCorriston, 1999). Understanding the nature of these needs, for example high anxiety with little relief, or boredom from understimulation, can provide effective alternatives for reaching these goals. Differences between problem gamblers and regular non-problem gamblers found across reversal theory measures may shed further light on the course of problem gambling behaviour, as well as possible predispositions for developing problems with gambling. Anderson and Brown (1987), looking at regular gamblers, found that reversal theory provides a useful theoretical framework for explaining gambling behaviour. These studies looked at casino gambling and playing blackjack.

Because of the differences found between different forms of gambling, in particular 'skilled' and 'unskilled' games, reversal theory needs be tested with other forms of gambling.

Dimensions of Gamblers

Griffiths and Delfabbro (2001) highlight the importance of considering gambling as a multifaceted behaviour, which may therefore not be able to be accounted for by a single theoretical perspective. In the same manner it is reasonable to assume that there could be subgroups of gamblers, and within particular groups certain contextual factors may be more relevant to the development and continuation of gambling.

Blaszczynski and Nower (2002) propose a conceptual-pathway model in which three main subgroups of pathological gamblers are identified, and also suggest that each of these three subgroups may be able to be divided further. Whilst all three sub-groups of pathological gamblers in this model are exposed to common influences there is the suggestion that different predispositions and risk factors come into play for each subgroup. The first group has been labelled the *normal problem gamblers* and is distinguished by the absence of premorbid psychopathology. The features of this group include a preoccupation with gambling, chasing losses, depression and anxiety. These symptoms are considered a consequence rather than a cause of gambling behaviour. The second group has been termed *emotionally disturbed gamblers.* This group displays higher levels of comorbid psychopathology such as depression, anxiety, coping deficits and an inability to manage external stress. Blaszczycnski and Nower suggest that this gambling group fits with the findings of Jacobs (1986) and Anderson and Brown (1984) with gambling used as a means of emotional escape.

The third group are defined by *biological correlates of gambling*; with a presence of neurological or neurochemical dysfunction, impulsivity and attention deficit features.

Potenza, Steinberg, McLaughlin, Wu, Rounsaville, and O'Malley (2000), when examining legal issues in problem gamblers found two differing subgroups of gamblers; one with arrests and incarcerations secondary to gambling and one without arrests or incarceration but still with legal problems. They found that the first group were associated with having antisocial personality traits, whereas the second group were more likely to have family issues and problems with borrowing money from legitimate sources. This would also fit with Blaszczynski and Nower's (2002) suggestion that there are various subtypes of problem gamblers.

Empirical Study - Factors Underlying Gaming Machine Play

Reversal Theory and Personality

The Role of Reversal Theory in Understanding Gambling Behaviour

Reversal theory offers an explanation of gambling behaviour from a motivational viewpoint. Suggestions that gambling may be used as a mechanism to alter mood state or "self medicate" (Coman, Burrows, & Evans, 1997; McCorriston, 1999) fit well with reversal theory, with gambling being used as a mechanism to manipulate or sustain hedonic tone. Other elements found to be associated with gambling behaviour such as increased level of perceived control (Gupta, 1997) may link in well with the transactional reversal theory domain. If individuals who gamble perceive their level of control as high they may be more likely to experience the positive mood states associated with winning, either maintaining or producing a reversal to the mastery state, thus optimising hedonic tone. Duong and Ohtsuka (1999) also report that problem gamblers are more likely to overestimate their chances of winning due to this perception of control, indicating that problem gamblers may be more mastery oriented whilst gambling.

Although previous studies (Anderson & Brown, 1987; Morton, 1996) have considered reversal theory as a mechanism for understanding gambling behaviour in general, reversal theory has not been used as a framework for understanding gambling behaviour with electronic gaming machines. Since gambling cannot be considered an homogenous activity (Dickerson, 1993) it is important that reversal theory be considered across a range of gambling activities.

Personality Variables Associated with Gambling Behaviour

Evidence for high levels of impulsivity in problem gambling samples has been mixed. Some research has found increased levels of impulsivity (Blaszczynski, et al., 1997, McCormick, Taber, Krudelbach, & Russo, 1987) and sensation seeking (Anderson & Brown, 1984; Wolfgang, 1988) amongst problem gamblers; other research has failed to find any differences on these measures between problem gambling and control participants (Allcock & Grace, 1988), or has found that problem gamblers score lower on sensation seeking than the general population (Dickerson, et al., 1987). Links between Cluster B personality disorders and problem gambling have also been found (Blaszczynski & Steel, 1998), linking problem gambling to higher levels of impulsivity; as this, along with affective instability, are characteristics of such disorders (Blaszczynski, et al., 1997).

One factor that may be related to these mixed findings is variations in the type of gambling engaged in. Higher rates of impulsivity and sensation seeking have often been associated with studies using gamblers whose primary forms of gambling have been horse racing or casino betting: both of these activities have also been shown by some researchers to produce increased arousal. People who experience problems with gambling also often participate in more than one form of gambling, making it more difficult to separate the role of factors such as impulsivity and sensation seeking in different gambling forms. Blaszczynski, Winter, and McConaghy (1986) suggest that gamblers select specific forms of gambling in order to meet their emotional needs, a suggestion supported by Chantal and Vallerand (1996).

Additionally, as discussed previously, the definition of impulsivity and sensation seeking may be important in understanding inconsistent findings. As discussed in Clarke (2004), sensation seeking comprises two separate facets; impulsiveness and venturesomeness, with Moore and Ohtsuka (1997) finding that problem gambling was predicted by low venturesomeness and high impulsiveness.

Another suggestion put forward by Griffiths and Delfabbro (2001) is that lower scores on sensation seeking may be attributed to the fact that problem gamblers engage in very few other activities, hence limiting the number of items endorsed on sensation seeking scales. While the role of both sensation seeking and impulsivity in gambling behaviour has been measured within clinical samples of problem gamblers (Steel & Blaszczynski, 1998), the measurement of both sensation seeking and impulsivity within non-problem/regular gamblers may also shed some light on the importance of these factors in the development and progression of gambling behaviour.

Dimensions of Gamblers

The above sections outline reversal theory and personality variables that may be associated with gambling, based on an underlying assumption that gamblers are an homogenous population. This approach assumes gambling is likely to occur on a continuum from non-gambling to high level/problem gambling. As stated in the Productivity Commission (1999) inquiry report, "there is no clear point, however, at which a recreational gambler becomes a problem gambler and, for problem gamblers there is a continuum of behaviour and impacts of escalating severity" (p.17). Recently there has been a shift towards seeing

gamblers as a heterogenous population, in much the same way that gambling forms are also now seen as heterogenous rather than homogenous.

Blaszczynski and Nower (2002) have proposed a conceptual pathways model of problem gambling in which three subgroups of problem gamblers have been put forward. These subgroups of gamblers have been described as *normal problem gamblers, biologically based gamblers* and *emotionally disturbed gamblers*. This form of classification of gamblers may be able to explain some of the discrepancies found in previous studies when looking for characteristics present in those who gamble excessively.

Aims and Hypotheses

This study aims to answer two questions; the first is more traditional and concerns identifying variables or traits; in this case reversal theory and personality, which distinguish between problem gamblers, regular gamblers and non-gamblers. This approach assumes that gambling occurs on a continuum from non-gambling to high level/problem gambling. The second question seeks to discover whether there are different psychological dimensions in gamblers which are consistent with the typologies identified by Blaszczynski and Nower (2002), and has clinical relevance as the identification of different dimensions of gambling has important implications for the tailoring of effective treatments.

Reversal Theory and Personality

The aim of this part of the study is to look at differences between problem, regular and non-gambling groups using a reversal theory framework and to explore the relationship between impulsivity (comprised of both impulsiveness and venturesomeness), sensation seeking and gaming machine play, in these

groups. A further aim is to explore differences in additional personality traits such as anxiety, between regular, problem, and non-gambling groups; and to examine levels of activity and sociability in each group as these may impact on any differences found in sensation seeking.

Because gambling is more likely to be experienced as pleasurable in a paratelic (playful/present oriented) state than a telic (goal directed/serious) state, it is hypothesized that problem and regular gambling groups will be more paratelic dominant than the non-gambling group, corresponding to the findings of Anderson & Brown (1987) that paratelic dominant individuals are more likely to seek out gambling to transform metamotivational state and arousal level than telic dominant individuals. Furthermore it is hypothesized that problem gamblers will score more highly on negativism than regular or non-gamblers as this state is related to behaviour that is rule breaking and non-conformist, characteristics that have been associated with problem gambling (Blaszczynski, Steel & McConaghy, 1997).

It is also hypothesized that problem gamblers will be more mastery oriented than regular or non-problem gamblers and thus be mastery dominant, supporting findings that problem gamblers have higher levels of control beliefs (Duong & Ohtsuka, 1999). Linking with this is a further hypothesis that problem gamblers will be more pessimistic than regular or non-gamblers, given that they have previously been found to have an external locus of control (Scheier & Carver, 1985) and that external locus of control is highly correlated with pessimism (Lo & Anjoul, 2001).

It is hypothesized that the problem gambling group will score more highly on impulsiveness and general sensation seeking than the regular or non-gambling

groups, but will score lower on venturesomeness than the regular gambling group. The regular gambling group is hypothesized to score more highly on general sensation seeking, impulsiveness and venturesomeness than the non-gambling group.

It is also hypothesized that there will be higher rates of neuroticism and anxiety in the problem gambling group than in the regular and non-gambling groups. It is expected that there will be a negative relationship between the impulsiveness and sensation seeking scale, and the activity scale as measured by the Zuckerman Kohlman Personality Questionnaire (ZKPQ; Zuckerman, Kuhlman, Joirement, Teta, & Kraft, 1993). It is also hypothesized that the problem gambling group will score lower on the activity and sociability subscales of the ZKPQ than the regular or non-gambling groups, and higher on the aggression-hostility subscale.

Dimensions of Gamblers

The aim of this part of the study is to identify factors within a sample of non-gamblers, regular gamblers and problem gamblers to determine if there are separate factor structures within the combined groups, and what motivational and personality variables may distinguish these factors. It is hypothesized that there will be four factors identified using an exploratory factor analysis: a non-gambling factor, and three other factors which are expected to correspond with the typologies identified by Blaszczynski and Nower (2002). Taking into account differences in motivation for gambling and reversal theory constructs it is expected that the factor analysis will reveal four independent factors that will display the following features:

- A non-gambling factor displaying negative loadings on a measure of problematic gambling, amount of time spent gambling, and underlying psychopathology.
- A *normal* gambling factor characterised by moderate loadings on impulsivity, anxiety, emotionality, and sociability.
- An *emotionally disturbed* factor with high loadings on a measure of problematic gambling, amount of time spent gambling, pessimism, emotionality, and moderate loadings on impulsivity.
- A *biological based* factor with high loadings on a measure of problematic gambling, amount of time spent gambling, impulsivity/sensation seeking, venturesomeness, aggression/hostility, and negative loadings on telicism.

Method

Participants

Participants were 171 volunteers who gave their informed consent to take part in these studies. All participants in the problem gambling and regular gambling groups played gaming machines as their primary gambling activity. Those who regularly took part in other forms of gambling (apart from lottery and keno) were excluded: 28 participants were excluded from the study on this basis. Two participants withdrew from the study without completing the questionnaires. The 141 remaining experimental participants were divided into three separate groups on the basis of their score on the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) and self-reported level of gambling.

Participants were recruited across the state of Tasmania via newspaper advertisements, Returned and Serviceman's League (RSL) Clubs, Breakeven

Gambling Support Services, community service organisations (e.g., Rotary Clubs), sporting organisations (e.g., bowls clubs) and advertisements at the University of Tasmania. Reimbursement of $10 to $20 for participant's costs of attending and/or time was made where appropriate.

The Problem Gambling (PG) group was made up of 45 individuals with a score of 5 or greater on the SOGS and/or a self-report of a problem with gambling: one participant was included with a score less than 5 on the SOGS, in this case the participant scored four on the SOGS and reported having a problem with gambling. The range of scores for this group on the SOGS was 4 to 21 with a mean score of 10.95 and a standard deviation of 3.78. The number of hours spent gambling per month was between 2 and 180 with a mean of 36.76 hours with a standard deviation of 44.86. Participants in this group were aged between 19 and 65 years with a mean of 44.11 years and a standard deviation of 13.92. Of this group 38% were male, 62% were female.

The Regular Gambling (RG) group comprised 41 individuals with a score of less than 5 on the SOGS and who did not report a gambling problem: one individual was included in this group with a SOGS score of 6, however, the participant did not report having a gambling problem, and only gambled 6 hours per month. These individuals played gaming machines once a month or more. The range of scores on the SOGS for this group was 0 to 6 with a mean score of 1.90 and a standard deviation of 1.45. The number of hours spent gambling per month was between 1 and 14 hours with a mean score of 4.10 hours and a standard deviation of 3.56. Participants in this group were aged between 18-72 years with a mean of 39.61 years and standard deviation of 17.02. In this group 24% were male and 76% were female.

The Non-Gambling (NG) group consisted of 55 individuals who did not gamble on any activities with the exception of lotto and keno. Scores on the SOGS were 0 or 1 and participants in this group had spent from 0 to 1 hour gambling per month. Participants in this group were aged between 20 and 70 years with a mean age of 43.24 years and a standard deviation of 14.25. Males comprised 35% of the group, females 65% of the group.

Materials

A questionnaire booklet was provided to participants. This booklet contained information about the study (see Appendix A1), a statement of informed consent (see Appendix A2) and the following measures: South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), Gambling Behaviour Questionnaire (see Appendix B), Telic Dominance Scale (TDS; Murgatroyd, Rushton, Apter & Ray, 1978), Zuckerman Kohlman Personality Questionnaire (ZKPQ; Zuckerman et al., 1993), Motivational Style Profile (MSP; Apter, Mallows & Williams, 1998), and the I7 (Eysenck, Pearson, Easting, & Allsopp, 1985).

South Oaks Gambling Screen (SOGS). The SOGS is a brief inventory widely used internationally to screen for potential gambling problems. The lifetime version that asks about problem gambling across one's lifetime was chosen for use in this study and has demonstrated good reliability and validity. Cut-off scores of five and above were used as recommended by Lesieur and Blume (1987) for classifying potential problem gamblers. Due to concern raised by some authors about the cut-off score of five in Australian samples (Battersby, Thomas, Tolchard, & Esterman, 2002; Dickerson, Baron, Hong & Cottrell, 1996; Tolchard & Battersby, 2000), an additional questionnaire (gambling behaviour

questionnaire) was devised and special emphasis was paid to self-reports of problem gambling to reduce false positives.

Gambling Behaviour Questionnaire. The gambling behaviour questionnaire was devised as a way of checking a number of pieces of relevant information for each of the three groups. This questionnaire looks at the presence or absence of other behaviours often looked at in the field of addictions (e.g., smoking, substance use), as well as providing demographic information and more detailed information about gambling types and time spent gambling than the SOGS is able to provide.

Telic Dominance Scale (TDS). The TDS consists of 42 alternative choice statements (e.g., "taking life seriously" or "treating life light-heartedly") as well as a "not sure" response option. Participants are required to choose the alternative they would usually prefer for each pair of statements, and are instructed to select the "not sure" option only if they are unable to make a choice. The TDS measures three subscales of telicism: serious mindedness, planning orientation and arousal avoidance. The subscale scores are summed to provide a total telic dominance score for each individual.

Motivational Style Profile (MSP). The MSP is a 70-item questionnaire measure with 10 subscales that measure the five pairs of metamotivational states identified in reversal theory. The salience and dominance of these states is derived arithmetically. The dominance score for each pair is obtained by subtracting the second subscale score from the first: a positive score indicates dominance in the direction of the first subscale and a negative score indicates dominance of the second subscale of the pair. Salience scores are obtained by addition of the subscale scores for each pair. A further four subscales are included

in the MSP which measure optimism, pessimism, arousability and effortfulness. The MSP comprises descriptive phrases (e.g., "Have fun", "Have intense feelings") that are rated on six-point scales (1 = never, 3 = sometimes, 6 = always).

Zuckerman Kohlman Personality Questionnaire (ZKPQ). The ZKPQ measures the five personality characteristics of *impulsive sensation seeking*, *neuroticism-anxiety, aggression-hostility, activity* and *sociability*. This questionnaire contains 100 statements (e.g., "I always win at games", "I often do things on impulse") to which participants are required to respond true or false. Ten of these items are infrequency items that highlight careless or questionable responding and are used as a validity check for questionnaire answers.

I7. The I7 is a 54 item self-report questionnaire which provides separate measures of *impulsivity, venturesomeness* and *empathy* in adults. Participants are required to circle either "yes" or "no" in response to the 54 questions provided such as "Do you sometimes find someone's laughter catching?" and "Do you feel sorry for very shy people?".

Procedure

Participants contacted the researcher following recruitment from the sources outlined above and received a questionnaire booklet either in person or by post with a reply paid postal envelope for its return. Participants were instructed to complete the booklet in one sitting if possible, or to ensure they had completed the whole of an individual questionnaire prior to taking a break. The booklet required approximately 30 to 45 minutes to complete.

To ensure that participants were able accurately able to comprehend the questionnaires, the first 20 participants in the PG group completed their

questionnaires in the presence of the experimenter. This was either on a one-to-one basis or in a small group setting. It is worth noting that following this, the questionnaire format was changed to a booklet (rather than individual questionnaires) and the font sizes were adjusted on some measures to facilitate visual consistency and easier completion.

Standard procedures were used to score the questionnaires. Where responses were missing for subscales the subscale for that participant was not included in the data set. Where an infrequency scale was included as a classification criterion, participants were excluded if their score on the scale was too high, thus ensuring validity of the results.

Data Analysis

Reversal Theory and Personality. The psychological measures form natural and coherent groupings of similar types of variables. The TDS provides a group of 4 variables with three subscales and a total TDS score. The MSP has three groupings of variables: 14 subscales, 5 dominance measures, and 5 salience measures. The I7 has three scales; the ZKPQ provides 5 scales. Parametric statistical analysis of these variables to identify specific differences between the gambling groups involves multiple comparisons of variables from the same participants. MANOVAs were performed as a primary omnibus analysis on coherent groupings of the psychological measures described above. MANOVA is the preferred method of analysis when multiple measures are involved (e.g., Vasey & Thayer, 1987). Follow-up ANOVAs and comparison of marginal means with Bonferroni adjustment were performed as necessary on the individual psychological variables to identify the specific source of significant group main effects revealed by the omnibus MANOVAs. The statistical analysis used

Fisher's LSD procedure (Maxwell & Delaney, 1990) which controls the Type 1 error rate by allowing post-hoc comparisons only to locate the source of significant effects previously revealed by omnibus analysis. The significance level used was $\alpha = 0.05$.

Dimensions of Gamblers. In order to determine whether the gambling sample comprised different groups, the data was submitted to exploratory factor analyses using a principal axis extraction with an orthogonal solution. A varimax rotation was then conducted to provide the final factor components. The variables included in the factor analyses were SOGS, hours per month, age, the 14 dominance subscales of the MSP, the three I7 scales and the five ZKPQ scales. The TDS scales were excluded due to the conceptual overlap with some of the MSP subscales.

Results

Participant Characteristics

Means, standard deviations and frequencies were calculated for participant variables in the problem gambling (PG), regular gambling (RG) and non-gambling (NG) groups and are presented in Table 2.

A one-way ANOVA was conducted to reveal any differences in age between the groups. No significant effects were found which shows that the three groups did not differ significantly with respect to age. A Chi-square was performed on the gender distribution for the three groups: no statistical difference was found, indicating the groups were equivalent with respect to gender composition. Due to the high standard deviation in the scores for hours per month spent gambling and the SOGS score an independent groups Chi-square analysis

was performed to determine if the groups significantly varied on these measures. Statistically significant differences were found between the groups for both the SOGS ($p < .01$) and hours spent gambling per month ($p < .01$), the findings indicating correct classification of groups.

Table 2

Means, Standard Deviations and Frequencies of Participant Characteristics of Age, Gender, SOGS Score and Hours Spent Gambling per Month (N=141).

	Problem Gamblers n = 55	Regular Gamblers n = 41	Non Gamblers n = 45
Age	44.11 (13.92)	39.61 (17.10)	43.24 (14.25)
Male (n)	21	10	16
Female (n)	34	31	29
SOGS	10.95 (3.78)	1.90 (1.45)	0.09 (0.23)
Hours per month	36.76 (44.86)	4.10 (3.56)	0.02 (0.15)

Reversal Theory Variables

TDS Scores. Means and standard deviations for the three TDS subscales and total TDS scores for the three groups are shown in Table 3. MANOVA showed a significant group difference across these scores, Wilks' Lambda = .864, $F(8, 266) = 2.52, p < .05$. One-way ANOVAs found a significant main effect for group only for the *seriousness* subscale of the TDS, $F(2,136) = 3.34, p < .05$. Comparison of marginal means with Bonferroni adjustment failed to reveal any significant differences between the groups on the *seriousness* subscale however.

Table 3

Means and Standard Deviations of Telic Dominance Scale (TDS) Subscales and Total Score for Problem Gambling, Regular Gambling and Non-Gambling Groups.

	N	Problem Gambling	Regular Gambling	Non-gambling
Serious-minded	140	4.71 (1.88)	3.68 (2.10)	3.98 (2.28)
Planning Orientation	140	4.44 (2.52)	4.24 (2.27)	5.41 (2.74)
Arousal-Avoidance	139	7.11 (2.85)	6.20 (2.69)	6.70 (2.68)
Total TDS Score	139	16.35 (5.64)	13.88 (5.46)	16.09 (6.28)

MSP Variables. Means and standard deviations for the 14 MSP subscales are shown in Table 4. MANOVA was used to determine if there were any overall differences on these variables between the three groups and showed a significant group difference, Wilks' Lambda = .547, F (28, 248) = 3.119, $p < .01$. Follow up analyses using one-way ANOVAs identified significant group effects for the subscales of *serious*, F (2,137) = 15.33, $p < .01$, *playful*, F (2,137) = 4.28, $p < .05$, *optimism*, F (2,137) = 16.70, $p < .01$, *pessimism*, F (2,137) = 23.63, $p < .01$, and *emotionality*, F (2,137) = 5.14, $p < .01$. Where there were significant group effects, a comparison of marginal means with Bonferroni adjustment was used to locate specific differences between groups. The significant pairwise comparisons were as follows. On the *serious* subscale of the MSP, problem gamblers scored significantly lower than both regular gamblers ($p < .01$) and non gamblers ($p < .01$). On the *playful* scale regular gamblers scored significantly higher than both problem gamblers ($p < .05$) and non gamblers ($p < .05$). On the *optimism* and

pessimism scales of the MSP the problem gambling group scored significantly lower on *optimism* and significantly higher on *pessimism* than both regular gambling ($p < .01$) and non gambling ($p < .01$). For *emotionality* problem gamblers scored significantly higher than non gamblers ($p < .01$).

Table 4

Means and Standard Deviations of MSP Subscales for Problem, Regular and Non-Gambling Groups (N = 140).

	Problem Gambling	Regular Gambling	Non-gambling
Serious	18.27 (3.73)	20.76 (3.65)	22.32 (3.62)
Playful	18.78 (4.30)	20.83 (3.69)	18.77 (3.08)
Arousal Avoiding	20.09 (3.49)	20.88 (3.19)	20.95 (3.90)
Arousal Seeking	16.02 (5.45)	17.66 (3.53)	16.34 (4.66)
Defiant	13.11 (4.80)	13.12 (3.43)	11.93 (4.31)
Compliant	20.65 (4.17)	21.76 (3.74)	21.25 (4.13)
Self-centred Mastery	17.76 (3.82)	19.20 (3.27)	18.34 (3.37)
Self-centred Sympathy	20.58 (4.78)	21.44 (5.05)	19.64 (4.24)
Other-centred Mastery	20.42 (4.56)	21.88 (4.18)	21.77 (4.28)
Other-centred Sympathy	23.38 (4.35)	24.22 (4.81)	23.64 (3.59)
Optimism	18.24 (4.36)	21.95 (3.13)	22.02 (3.45)
Pessimism	17.55 (4.58)	13.02 (4.44)	12.09 (3.60)
Emotionality	20.53 (4.83)	18.85 (3.86)	17.86 (3.56)
Effortfulness	21.22 (4.27)	22.05 (3.91)	23.02 (3.75)

Means and standard deviations for the five dominance scales of the MSP are shown in Table 5. MANOVA was used to determine if there were any overall differences on the dominance scales between the three groups and showed a significant difference, Wilks' Lambda = .854, F (10, 266) = 2.178, $p < .05$. Follow-up analyses using one-way ANOVAs identified significant group effects for *serious/playful* dominance, F (2, 137) = 8.87, $p < .01$. Comparison of marginal means with a Bonferroni adjustment revealed that non gamblers were significantly more *serious* dominant than problem gamblers ($p < .01$) and regular gamblers ($p < .01$).

Means and standard deviations for the five salience scales of the MSP are shown in Table 6. MANOVA was used to determine if there were any overall differences on the salience scales between the three groups and showed a significant difference, Wilks' Lambda = .818, F (10, 266) = 2.82, $p < .01$. Follow-up analyses using one-way ANOVAs identified significant group effects for the salience of the *serious/playful*, F (2, 137) = 10.31, $p < .01$, and *arousal avoidance/arousal seeking* pairs, F (2, 137) = 3.33, $p < .05$. Comparison of marginal means with a Bonferroni adjustment revealed that problem gamblers were significantly lower on *serious/playful* salience than regular gamblers or non gamblers ($p < .01$). Problem gamblers were also found to be significantly lower on the *arousal-avoiding/arousal-seeking* salience measures than were regular gamblers ($p < .05$).

Table 5.

Means and standard deviations for the five dominance scales of the MSP (N = 140).

	Problem Gambling	Regular Gambling	Non-gambling
Serious/ Playful	- 0.33 (5.16)	- 0.07 (5.13)	3.50 (4.16)
Arousal Avoiding/Arousal Seeking	3.85 (7.45)	3.10 (5.23)	4.34 (7.04)
Defiant/ Compliant	- 7.60 (7.35)	- 8.39 (5.44)	- 9.32 (7.19)
Autic mastery/sympathy	- 2.16 (7.37)	- 2.24 (4.60)	- 1.25 (4.76)
Alloic mastery/sympathy	- 2.11 (7.42)	- 2.10 (3.22)	- 1.91 (3.56)

Table 6.

Means and standard deviations for the five salience scales of the MSP (N=140).

	Problem Gambling	Regular Gambling	Non-gambling
Serious/ Playful	36.47 (7.47)	41.59 (5.25)	41.14 (5.28)
Arousal Avoiding/Arousal Seeking	35.31 (7.94)	38.54 (4.19)	37.30 (5.17)
Defiant/ Compliant	33.93 (5.20)	34.63 (4.43)	33.18 (4.42)
Autic mastery/sympathy	38.24 (7.07)	40.63 (7.15)	37.98 (6.00)
Alloic mastery/sympathy	43.80 (8.03)	45.85 (7.43)	45.39 (7.09)

Personality Variables

I7. Means and standard deviations for the three I7 subscales for the three groups are shown in Table 7. MANOVA showed a significant group difference between the I7 scores, Wilks' Lambda = .811, F (3, 121), $p < .01$. One-way ANOVAs found a significant main effect for group only for the *impulsiveness* scale of the I7, F (2,123) = 12.622, $p < .01$). Comparison of marginal means with Bonferroni adjustment showed that the non-gambling group scored significantly lower than both regular gamblers ($p < .01$) and problem gamblers ($p < .01$) on the *impulsiveness* subscale.

Table 7

Means and standard deviations of I7 scores for problem gambling, regular gambling and non-gambling groups.

	N	Problem Gambling	Regular Gambling	Non-gambling
Impulsiveness	134	9.46 (4.48)	8.51 (4.31)	5.28 (4.19)
Venturesomeness	136	6.04 (4.69)	6.98 (4.28)	5.30 (4.12)
Empathy	132	14.53 (3.08)	14.13 (3.27)	13.52 (3.16)

ZKPQ Scores. Means and standard deviations for the ZKPQ scales were calculated and are shown in Table 8. MANOVA was used to determine if there were any overall differences in these variables between the three groups and showed a significant overall group difference, Wilks' Lambda = .611, F (10,252) = 7.038, $p < .01$. Follow up analyses using one-way ANOVAs identified significant group effects for the subscales of *impulsive/sensation seeking* ($p < .05$),

neuroticism/anxiety ($p < .01$), *aggression/hostility* ($p < .01$) and *sociability* ($p < .01$). Comparison of marginal means with Bonferroni adjustment was used to locate specific differences between groups. The significant pairwise comparisons were as follows. On the *neuroticism/anxiety* scale problem gamblers scored significantly higher than both regular gamblers ($p < .01$) and non gamblers ($p < .01$), with regular gamblers also scoring significantly higher than non gamblers ($p < .05$). On the *aggression/hostility* scale problem gamblers scored higher than non gamblers ($p < .01$) and regular gamblers scored higher than non gamblers ($p < .05$). Problem gamblers and regular gamblers were not significantly different on this measure. On the *sociability* scale problem gamblers scored significantly lower than regular gamblers ($p = .011$). Post hoc comparisons failed to reveal any differences between groups on the *impulsive/sensation seeking* scale.

Table 8

Means and standard deviations of ZKPQ scores for problem, regular and non-gambling groups (N=133).

	Problem Gambling	Regular Gambling	Non-Gambling
Impulsive/Sensation Seeking	8.23 (4.74)	8.95 (4.53)	6.09 (4.39)
Neuroticism/Anxiety	12.52 (4.88)	8.95 (5.06)	6.40 (4.22)
Aggression/Hostility	7.25 (4.04)	6.88 (2.74)	4.77 (2.59)
Activity	8.47 (3.90)	7.28 (4.01)	8.29 (3.65)
Sociability	5.77 (3.84)	8.34 (4.44)	7.11 (4.26)

In order to test the specific prediction that the ZKPQ scale of *activity* would be positively correlated with the *impulsive/sensation* seeking scale of the ZKPQ a Pearson Product Moment correlation was used: a significant correlation ($r = .23$, $df = 136$, $p < .01$) was found.

Dimensions of Gamblers

The first factor analysis included all three groups of participants. Factor loadings were classified as high (> .65), medium (.45 - .64) and low (< .44) based on guidelines by Tabachnick and Fidell (1996). The Kaiser-Myer-Olkin measure of sampling adequacy for this analysis was .756 which is considered middling (Kaiser, 1974). It was determined that a three factor solution best described the data and was a clear cut solution from a consideration of the scree plot (see Appendix C1). The unrotated factor solution is shown in Appendix C2, the rotated solution is shown in Table 9. Combined, these three factors accounted for 54.33% of the variance.

The first factor accounted for 21.11% of the variance and did not load on hours per month or SOGS and was best defined by *impulsive/ sensation seeking, arousal seeking, venturesome, playful* and *defiant* states and traits (high loadings). The second factor accounted for 16.8% of the variance and is best defined as a non-gambling factor (negative loadings on SOGS and hours per month) and includes measures of *seriousness, other centered mastery, other centred sympathy, compliant* and *effortfulness* (high loadings) as well as *arousal avoiding, self-centred sympathy* and *optimism* (medium loadings). The third factor accounted for 16.42% of the variance and was characterised by gambling behaviour (medium loading on SOGS), and negative mood states such as *neuroticism/anxiety,*

emotionality and *pessimism* (high loadings). This factor also had medium loadings on *impulsiveness, empathy* and *aggression/hostility.*

As none of the 3 factors of the first factor analysis differentiated clearly a gambling versus non-gambling factor, a second factor analysis was carried out excluding the non-gambling group and including the dependent variables used in the previous analysis. The Kaiser-Myer-Olkin measure of sampling adequacy for this analysis was 0.69, which is considered mediocre but acceptable. From the scree plot it was determined that a three factor model best described the results, with the three factors clearly separated from the following factors (see Appendix C3). Additionally, these three factors combined accounted for 51.21% of the variance, whereas the addition of further factors did not significantly increase the variance accounted for. The unrotated factor solution is shown in Appendix C4, the rotated solution is shown in Table 10. The first factor, accounting for 20.08% of the variance is best characterised as being those who are *impulsive, sensation seeking* and *venturesome,* sociable and self-focused (autocentric). For this factor the high loadings were all on measures associated with impulsivity (*impulsive/sensation seeking, playfulness,* and *arousal seeking*) with a medium loading found on *defiant* and low loadings on the other variables outlined above.

The second factor, accounting for 16.79% of the variance is best characterised as *serious, other focused* and *effortful* (high loadings), as well as *arousal avoiding*, engaged in various activities (according to the *activity* scale*)*, *compliant* and *optimistic* (medium loadings). Low positive loadings were found for *age* and *self-centred mastery* with a low negative loading on *aggression/hostility.* This factor did not load on either SOGS or hours per month.

The third factor accounted for 14.34% of the variance and can be best described as those who have higher SOGS scores (medium loading). This factor is characterised by negative emotional states, with high loadings on *neuroticism/ anxiety, pessimism* and *emotionality* and also has medium loadings on the *arousal avoiding, compliant, self-focused sympathy,* and *empathy* scales. This factor also has a low negative loading on *venturesomeness* and a low positive loading on *impulsivity.*

Table 9

Factor Loadings for Rotated Solution for Data from Non-gambling, Problem Gambling and Regular Gambling Groups (loadings < .30 omitted).

Variables	Factor 1	Factor 2	Factor 3
Age	--	--	--
Hours per month	--	-.38	.40
SOGS	--	-.30	.64
Impulsive/Sensation Seeking (ZKPQ)	.76	--	--
Neuroticism/Anxiety (ZKPQ)	--	--	.87
Aggression/Hostility (ZKPQ)	.34	--	.50
Activity (ZKPQ)	.39	--	--
Sociability (ZKPQ)	.61	--	--
Seriousness (MSP)	--	.76	-.31
Playfulness (MSP)	.78	.31	--
Arousal Avoiding (MSP)	-.51	.63	--
Arousal Seeking (MSP)	.83	--	--
Defiant (MSP)	.69	--	--
Compliant (MSP)	--	.69	--
Self-centred Mastery (MSP)	.51	.44	--
Self-centered Sympathy (MSP)	--	.49	.44
Other-centered Mastery (MSP)	--	.71	--
Other-centered Sympathy (MSP)	--	.70	--
Optimism (MSP)	.42	.58	-.50
Pessimism (MSP)	--	--	.84
Emotionality (MSP)	--	.44	.70
Effortfulness (MSP)	--	.71	--
Impulsivity (I7)	.59	--	.53
Venturesomeness (I7)	.69	--	--
Empathy (I7)	--	.33	.54
Eigenvalue	5.28	4.20	4.11
Variance Accounted for	21.11%	16.80%	16.42%

Table 10

Factor Loadings for Rotated Solution for Data from Problem Gambling and Regular Gambling Groups (loadings < .30 omitted).

Variables	Factor 1	Factor 2	Factor 3
Age	--	.32	--
Hours per month	.39	--	--
SOGS	.38	--	.53
Impulsive/Sensation Seeking (ZKPQ)	.82	--	--
Neuroticism/Anxiety (ZKPQ)	--	--	.87
Aggression/Hostility (ZKPQ)	--	-.39	--
Activity (ZKPQ)	.32	.45	--
Sociability (ZKPQ)	.65	--	--
Seriousness (MSP)	--	.83	--
Playfulness (MSP)	.77	--	--
Arousal Avoiding (MSP)	-.32	.54	.50
Arousal Seeking (MSP)	.77	--	--
Defiant (MSP)	.58	--	--
Compliant (MSP)	--	.55	.47
Self-centred Mastery (MSP)	.44	.35	--
Self-centered Sympathy (MSP)	.34	--	.64
Other-centered Mastery (MSP)	--	.76	--
Other-centered Sympathy (MSP)	--	.66	--
Optimism (MSP)	.44	.60	--
Pessimism (MSP)	--	--	.71
Emotionality (MSP)	--	--	.70
Effortfulness (MSP)	--	.82	--
Impulsivity (I7)	.69	--	.34
Venturesomeness (I7)	.58	--	-.40
Empathy (I7)	--	--	.66
Eigenvalue	5.02	4.20	3.59
Variance Accounted for	20.08%	16.79%	14.34%

Discussion

The results of the present study showed some support for the use of reversal theory as an explanation of gambling behaviour and also identified relationships between personality variables and gambling as measured by the ZKPQ and the I7. Differences between problem, regular and non-gamblers were found on a number of the reversal theory constructs as well as on personality measures. Additionally the results of principal components analysis suggest that there are three different components or factors present in the gamblers in this study, with these factors being consistent with the typology proposed by Blaszczynski & Nower (2002).

Reversal Theory Findings

Somatic Metamotivational States. The reversal theory somatic states, in particular the telic/paratelic pair, have been implicated in motivations for gambling behaviour (Brown, 1989; 2001). In this study differences between problem, regular and non-gamblers were found for this pair of somatic states, but differed from those hypothesized. It was expected that both problem and regular gamblers would endorse the playful/paratelic state more highly and be more dominant in this state than non-gamblers. Regular gamblers did score more highly on the MSP subscale of *playfulness*, corresponding to the reversal theory paratelic state but there was no difference between problem and non-gambling groups on this measure. Findings for regular gamblers, but not problem gamblers, support those of Anderson and Brown (1987), that gamblers are more paratelic than non-gamblers. Differences were also found between groups when looking at the *serious* metamotivational state, with problem gamblers being significantly less

serious than both regular and non-gamblers. Looking at the three groups in terms of dominance of the *serious* and *playful* metamotivational states, the regular and problem gambling groups were not dominant in either state (scores almost equal in both states), whereas the non-gambling group was much more *serious* dominant.

Consideration of the level of gambling behaviour (i.e., regular/problem) may be useful in explaining differences between problem and regular gambling groups on the measures of *playfulness* and *seriousness*. If as Lesieur (1984) suggests, gamblers' motivation changes across the progression from regular gambling to problem gambling, then it is likely that motivational state or the use of gambling to induce particular motivational states would also change. Whereas Anderson and Brown (1987) concluded that their gambling sample used gambling to induce reversals to the gamblers' dominant and preferred state, it seems problem gamblers may be in the paratelic state less often overall because of the negative consequences of excessive gambling. Thus, while problem gamblers may still use gambling to reverse to the paratelic state, they may not be paratelic dominant.

The finding that regular gamblers scored similarly to non-gamblers on the *serious* subscale suggests that people who gamble in a non-problematic way do not have an overall tendency to be less goal-directed in day-to-day activities. Problem gamblers however were shown to be less *serious* than regular and non-gamblers, suggesting a decreased level of goal directed and planned activities. This finding supports research suggesting that problem gamblers are more impulsive (Moore & Ohtsuka, 1997) and in some cases, more likely to ignore

future consequences of behaviour (Bechara, 2003) than non-gamblers or regular gamblers.

Although regular gamblers scored significantly more highly on *playfulness* than problem and non-gamblers, they were not found to be paratelic dominant as hypothesized. Instead it was found that both regular and problem gamblers were balanced in the dominance of the *serious/playful* metamotivational states, with non-gamblers being more *serious* dominant. Results also indicated that problem gamblers find the *serious/playful* metamotivational states less salient to them than do regular or non-gamblers, with the *arousal avoiding/arousal seeking* metamotivational states also being less salient to the problem gambling group compared to regular gamblers.

No differences were found between the three groups for the other somatic metamotivational state pairs, *negativism/conformity*, or for the dominance or salience of these states, although it was hypothesized that problem gamblers would score more highly on *negativism* than regular or non-gamblers. This finding may be explained by the fact that the majority of individuals in the problem gambling group were currently seeking treatment for their gambling behaviour. Treatment seeking behaviour is likely to be an individuals' attempt to conform to expectations of their family, friends and society in general in regard to their gambling behaviour; thus, gamblers receiving treatment may not accurately represent the entire population of problem gamblers. Additionally, gaming machines have been considered more socially acceptable than wagering on sports, particularly for females, and it is likely that electronic gaming machines may attract people who are more conformist than those who participate in other types of gambling.

Transactional Metamotivational States. No differences were found between groups for the measures of *autic mastery, autic sympathy, alloic mastery* and *alloic sympathy* or for the dominance or salience measures of these states. It was hypothesized however that problem gamblers would be more mastery-oriented than regular or non-problem gamblers. One explanation for the lack of differences between groups is that gambling may be used to induce feelings of mastery whilst gambling, but this does not generalise to other areas of the gambler's life. Problem gamblers have been found to have a tendency to see themselves as more skilled at games of chance, and see games of chance in general as more skill-based than other people (Delfabbro, Grabosky, & Lahn, 2005), suggesting that they are more likely to feel in control whilst gambling. Additionally, problem gamblers have been found to display higher levels of negative emotional states such as anxiety and depression, and are less likely to feel in control of their emotional states. It seems likely that these individuals may rely on gambling to induce the mastery state and experience feelings of control, as they may not feel in control in other areas of their lives.

Motivational and Emotional Tendencies. The hypothesis that problem gamblers will be more pessimistic than regular or non-gamblers was supported, with problem gamblers scoring significantly higher on *pessimism* and lower on *optimism* than both regular and non-gambling groups. This supports the findings of Lo and Anjoul (2001) but did not occur in conjunction with higher levels of mastery as was expected. However, if gamblers experience an external locus of control as suggested by Scheier and Carver (1985) then it is likely that beliefs of control are quite specific to gambling activities and would not generalise to feelings of control over other aspects of life. As such, gamblers may be in the

mastery state whilst gambling but this cannot be measured by tests such as the MSP that measures long term general traits.

Problem gamblers were also shown to score significantly higher than regular or non-gamblers on the metamotivational tendency of *emotionality*, which involves becoming emotionally aroused whether this is desired or not, and supports findings that problem gamblers are emotionally labile (Blaszczynski, Steel, & McConaghy, 1997). This higher level of emotional lability suggests this group would reverse between metamotivational states more frequently. In conjunction with this, it is likely that this group has some difficulty maintaining pleasant hedonic tone as their reversal between states is more frequent, and as a consequence less controllable or predictable. If so, it may be that gambling is used more often as it has been found to be a more reliable mechanism for manipulating hedonic tone. The tendency towards *effortfulness* or the tendency to pursue goals did not differ between the groups.

Personality Variable Findings

Impulsivity, Sensation Seeking and Venturesomeness. It was hypothesized that problem gamblers would score more highly on measures of impulsivity and sensation seeking than would regular gamblers or non-gamblers. Furthermore it was hypothesized that regular gamblers would also score higher on *impulsivity/sensation seeking* than non gamblers and would score higher on *venturesomeness* than either non-gamblers. In partial support of these hypotheses, both problem and regular gamblers scored higher on the *impulsiveness* subscale of the I7 than did non-gamblers. No significant differences were found between the groups on the *impulsive/sensation seeking* scale of the ZKPQ however. These findings support the notion that gamblers, both regular and problem, are more

impulsive than non-gamblers but are not more *sensation seeking* or *venturesome.* This is important given the individuals in this study only gambled on gaming machines and were not involved in other forms of gambling such as horse racing or sports betting which have more traditionally been believed to be related to impulsivity. Coventry and Constable (1999) found that sensation seeking was negatively correlated with fruit machine play although it was physiologically arousing. Impulsivity therefore seems to have a more valid association with gambling behaviour than does sensation seeking.

As discussed earlier, Clarke (2004) suggests that sensation seeking is comprised of two facets; impulsiveness and venturesomeness. In the *I7* these two facets are separate whereas the ZKPQ *impulsive/sensation seeking* scale measures these together. The lack of differences in impulsivity using the *ZKPQ* can be at least in part explained by the differences in this measurement. The findings of the current study partially support those of Moore and Ohtuska (1997) who characterised those who experienced problems with their gambling as high on impulsiveness and lower on venturesomeness than did those with less problematic gambling. In the current study there were no differences found between the groups on the *venturesomeness* scale. With problem and regular gamblers both being higher on *impulsivity* but not *sensation seeking* or *venturesomeness,* it suggests that in previous studies that found mixed levels of impulsivity and sensation seeking in these groups, this may have been due to the use of scales which combine these two constructs rather than measuring them separately. The ZKPQ scale that combines impulsivity and sensation seeking failed to differentiate gamblers and non-gamblers in this study as opposed to the separate

scales in the I7: this highlights the importance of measuring the two constructs separately in gambling research.

Neuroticism/Anxiety. The results supported the prediction that problem gamblers would score more highly on the *neuroticism/anxiety* scale than the regular and non-gambling groups, in turn showing support for higher levels of affective instability and emotional disturbance in problem gamblers (Blaszczynski, et al., 1997; Crockford & el-Guebaly, 1998). As discussed by Blaszczynski and Nower (2002) it is difficult to determine whether affective disturbances are a primary cause of, or secondary result of, gambling behaviour, and it seems likely that there is a complex interaction of both primary and secondary processes.

Aggression/Hostility. Problem and regular gamblers were not significantly different from each other on the measure of *aggression/hostility* but both scored significantly higher than the non-gambling group. It had been hypothesised that only problem gamblers would show elevations on this measure. However as both problem and regular gamblers scored higher on *impulsivity* than non-gamblers, it can be expected that they would also both score higher on *aggression* and *hostility*, traits that have been demonstrated to be linked to impulsivity. Of note is the fact that both problem and regular gamblers scored more highly on *impulsivity*, as well as *aggression/hostility*. As the regular gamblers in this group had low scores on the SOGS and on average gambled for 4 hours per month, it was not expected that they would score higher than the non-gambling group on *aggression* or *hostility*. This suggests that regular gamblers are closer to problem gamblers on this personality trait than they are to non-gamblers. It is possible that

impulsivity as well as aggression/hostility are underlying traits that makes gambling more appealing or salient to these individuals.

Activity. There were no significant differences found between the groups on *activity,* however there was a significant but low positive correlation found between *activity* and *sensation seeking* supporting Griffiths and Delfabbro's (2001) suggestion that differing findings on sensation seeking may be due to problem gamblers endorsing fewer items on sensation seeking scales due to engaging in very few other activities. However, in the case of this study as there were no differences between the groups on activity it can be assumed that this factor will not have influenced the measured levels of impulsivity and sensation seeking.

Sociability. As hypothesised the problem gambling group scored lower on *sociability* than did regular gamblers, but although the mean score was lower, there was no significant difference found between problem gamblers and non-gamblers on this measure. As problem gamblers scored more highly on the *neuroticism/anxiety* scale it would be expected that their negative emotional state would have an impact on their *sociability.* The *sociability* scale in the ZKPQ measures two main factors; dislike of social isolation and liking of social gatherings. There is some overlap therefore on item type between the *impulsivity* and *sensation seeking* scales in both the ZKPQ and I7 and the *sociability* scale. As such it would be expected that less sociable individuals would score lower on *impulsivity/sensation seeking* scales. It is possible that due to this overlap between scales, the problem gambling group may have scored lower on *sensation seeking* and *impulsivity* due to their lower levels of *sociability.*

Reversal Theory and Personality Summary

There are a number of explanations for the differences in results from those hypothesised. Hypotheses were made with some level of expectation that regular and problem gambling are on a continuum, thus expecting similar results but at different magnitudes for these two groups. It is likely that the differences found between the groups in reversal theory measures and personality variables indicate separate groups rather than a continuum of gambling severity. The regular gambling group may be considered a more playful group although still maintaining a level of serious, goal directed activities, whereas the problem gambling sample were less telic or serious in general but not more playful and did not find these states salient in comparison to the regular gamblers. Problem gamblers may not display any tendency towards being paratelic, rather gambling seems to be used as one of the sole strategies to reverse states leading to an over reliance on this strategy.

Similarly, findings that problem gamblers were *impulsive, aggressive/hostile* and also *neurotic* and *anxious,* also suggest more than one subgroup of problem gamblers in this sample. The relationship between what Eysenck and Eysenck (1991) refer to as *true impulsiveness* and antisocial attitudes is well established. It seems unlikely however to find these traits coexisting with anxiety and neuroticism. Petry (2001) suggested that the multi-factorial nature of impulsivity may lead to discrepancies in findings of higher levels of impulsivity in problem gamblers; but, although this may account for some differences, the presence of different subgroups of problem gamblers is also a viable explanation.

Dimensions of Gamblers

The failure to find some of the expected differences between the regular and problem gambling groups on reversal theory and personality measures may be attributed to different motivations for gambling and underlying traits for each of these groups. The first aim of this study was based on the concept of gambling as a continuum; differences in results from those hypothesised suggest that the regular and problem gambling groups did not differ in a manner that would be expected on the basis of gambling severity alone. The exploratory factor analyses carried out in order to examine the second aim was consistent with this idea, with three separate factors being identified using the combined regular and problem gambling sample. The factors displayed loadings on variables that closely resembled the characteristics of the subgroups proposed by Blaszczynski and Nower (2002) in their pathways model of problem gambling.

The results of principal components analysis suggest that there are three different components or factors present in the gamblers in this study. Although a four-factor solution was hypothesized, the predicted patterns of variable loadings were not apparent in the initial analysis of the combined non-gambling, regular gambling and problem gambling groups. A separate non-gambling factor was clearly present in the first principal components analysis but there was also an impulsive factor that did not load on any of the gambling variables. A second analysis was performed using only the gambling groups. This provided a more parsimonious and theoretically consistent solution with three factors which are generally consistent with the original hypotheses, that factors would be found with

characteristics congruent with the three gambling subgroups proposed by Blaszczynski and Nower (2002).

Factor 1 identified in the principal components analysis was identified as a biological arousal factor and has characteristics that correspond well to the impulsive type gambling subgroup or *biological correlates* group as described by Blaszczynski and Nower (2002). This factor included high loadings on four predicted variables being *impulsive, sensation seeking, arousal seeking* and *venturesomeness,* as well as *sociability* and *defiance.* There were low loadings on *optimism, self-centered mastery and sympathy, activity, hours per month, SOGS,* and a low negative loading on *arousal avoidance.* Impulsivity and sensation seeking are often linked with negative mood states such as aggression and hostility, but *aggression/hostility* did not load on this factor in this solution, although the measure of *defiance* did.

The use of regular gamblers and problem gamblers who are seeking treatment may have influenced the variable loadings on this factor in particular. It seems likely that aggressive/hostile behaviour will usually be found in conjunction with sensation seeking traits, and is less likely in a group seeking treatment for gambling problems in comparison to a group containing all problem gamblers who may not be currently seeking treatment. If the gambling behaviour in the groups had been more problematic (e.g., higher SOGS scores, gambling for more hours per month) then it is likely that associated negative traits (e.g., aggression, hostility, antisocial behaviour) would have also been found. This factor had a moderate loading on *sociability* that indicates that gambling was possibly used as a social activity.

Gambling on gaming machines has often been thought to be less likely to attract impulsive gamblers than other forms of gambling, with Adkins, Kruedelbach, Toohig, and Rugle (1987) finding that those who play skilled games were more outgoing and less depressed. However it is clear from this study that at least some of those who gamble on gaming machines also show elevated *impulsivity, sensation seeking* and *venturesomeness*. Reversal theory describes this type of gambler as normally being paratelic/negativistic (defiant), with a high need for excitement and high physiological arousal: gambling is one way of ensuring high arousal is experienced in the paratelic state as excitement or provocativeness, whereas low arousal produces the unpleasant feelings of boredom or sullenness.

Factor 2 was interpreted as a normal gambling factor. This factor did not load on SOGS or hours per month, however as the sample consisted only of gamblers, it is certain that gambling is relevant and involved. This factor did not include any psychopathology and had high loadings on *seriousness, arousal avoidance, compliance, other centered mastery and sympathy, optimism* and *effortfulness*. *Activity* also loads moderately on this factor, indicating involvement in a variety of different activities, and that gambling is not the sole focus in the gambler's life.

Blaszczynski and Nower (2002) proposed a *normal* problem gambling subgroup, without major signs of premorbid psychopathology but with symptoms such as depression and anxiety secondary to their gambling. The normal gambling factor in this study did not show these secondary symptoms. Differences in characteristics between Blaszczynski and Nower's normal problem gambling groups and the normal gambling factor revealed in this study, specifically the lack

of problems such as anxiety and depression, is possibly due to lower levels of gambling in this sample as well as the inclusion of regular along with problem gamblers. If the regular gamblers were extracted from this sample then it is likely that the secondary signs of problematic gambling would become more apparent. Also the scales used in this study measured personality traits and metamotivational state dominance; if measures of current anxiety and depression symptoms were employed these may have shown elevated levels of these psychological problems within this sample.

Factor 3 is an emotional gambling factor and corresponds with the characteristics of the *emotional gamblers* subgroup described by Blaszczynski and Nower (2002). This factor was found to have a moderately high loading on the SOGS measure indicating problem gambling, as well as having high to very high loadings on *neuroticism/anxiety, self-centered sympathy, pessimism, emotionality,* and *empathy,* and moderate loadings on *arousal avoidance* and *compliance.* Blaszczynski and Nower (2002) proposed that their emotional problem gamblers gamble as a means to modulate affective states or to meet specific psychological needs, and this is consistent with the variables profile of Factor 3. This fits with previous research that suggests some individuals gamble in order to self-medicate and provide relief from negative mood states (Jacobs, 1988; McCorriston, 1999). In reversal theory terms, these individuals are normally anxious and feel high physiologically-based arousal, feel sorry for themselves, are pessimistic, emotional, and sensitive to feelings: they use gambling as a coping mechanism, to reverse to a paratelic state where their high arousal can be experienced as pleasurable and exciting rather than as unpleasant anxiety. These gamblers justify

their gambling as a legitimate reward or "treat" because they feel sorry for themselves, not just because they think they will win.

Implications for Treatment

The study identified separate factors within a group of gamblers, lending support to the notion of subgroups of gamblers. Identification of subgroups of gamblers allows for interventions to be developed that target the specific needs of each subtype of gambler, and may also provide some insight into the underlying factors that make gambling problems more likely to develop. Blaszczynski & Nower (2002) discuss the different treatment options that may be applicable to the subgroups they identified, with each subgroup requiring specific interventions to target the behaviour and, where necessary, underlying psychological or physiological elements. Griffiths and Delfabbro (2001) also highlight the need to address factors that provide the underlying motivations for gambling, further highlighting the need to distinguish such motivations in order to plan an appropriate treatment strategy.

One mechanism for looking at differing motivations within subgroups is the use of reversal theory. Problem gambling is seen as a temporally inappropriate strategy for reducing distress or obtaining gratification. While such strategies may be functional in the immediate short-term, they have unfortunate long-term consequences and result in considerable long-term problems. Smoking is another temporally inappropriate strategy used to increase hedonic tone. Reversal theory has been applied to the understanding of smoking cessation, recognising the need to target treatment to individual motivations and emotional states. O'Connell, Cook, Gerkovich, Potocky and Swan (1990) suggest that coping strategies to resist smoking will be optimally effective if targeted to each

particular metamotivational state, with effective strategies for resisting urges differing depending on state. As discussed by O'Connell, Gerkovich, Bott, Cook and Shiffman (2000), the decision to quit smoking is usually made in the telic state but must be sustained during paratelic and negativistic states. O'Connell, et al. (1995) also highlight this inconsistency stating that a number of the strategies suggested to smokers to resist smoking have a telic orientation. In a similar way, the identification of metamotivational state changes across a gambling episode could allow tailoring of intervention strategies that produce similar, desired state changes. In particular, alternative mechanisms to relieve dysphoric mood states would be valuable given their importance in lapse/relapse (Echebúrua & Fernández-Montalvo, 2005). Better identification of the metamotivational states likely to produce a lapse would also allow for a variety of alternative strategies to be taught to problem gamblers with the aim of providing appropriate strategies for a number of situations.

Limitations of the Study

One limitation of this study was the use of a problem gambling group of which the majority were currently seeking treatment for their gambling problems. Although this study looked at personality traits that should remain stable over time it is possible that it only involved a subgroup of problem gamblers; that is, those willing and interested in changing their gambling behaviour. It may be that treatment itself alters some of the variables otherwise associated with problematic gambling; for example, poor planning may be overcome by treatment associated with increasing planning ability. It is also probable that gamblers who seek treatment display different characteristics than those who do not seek treatment. Problem gamblers not involved in treatment are more likely to display higher

levels of impulsivity thus separating them more clearly from the regular gambling sample. Additionally, treatment seeking may increase the time spent in a telic state, as individuals are encouraged to be goal directed with the aim of controlling or changing their problematic gambling behaviour. As part of their treatment a number of gamblers in the study had voluntary self-exclusions in place, prohibiting their entry into gaming venues and a large number reported experiencing financial or relationship difficulties. As previously outlined, problem gamblers are also more likely to be depressed/anxious thus decreasing feelings of playfulness or time spent in playful states.

The reversal theory measures used in this study both look at an individual's general tendency of dominance in these states. Future research examining situational dominance or state balance whilst gambling would provide a clearer indication of the role of reversals in gambling. Use of measures prior to, during, and after gambling would improve knowledge of changes of metamotivational state across a gambling episode; however, this would not have been ethically appropriate for the problem gambling group in this study as they were currently seeking treatment. It would be useful to apply the methodology of Sharpe (2004) who examined arousal responses to imaginal gambling scenarios. The addition of reversal theory measures to this paradigm would provide important information on both changes to arousal and metamotivational state in electronic gaming machine players. In order to apply reversal theory more successfully to understand gambling behaviour and planning treatment interventions, it will be necessary to be able to measure changes in motivational state at various stages across a gambling episode.

Directions for Future Research

As discussed previously a useful area for future research would be to examine data for a sample of problem gamblers who were not undergoing treatment to determine the applicability of the current findings to this group. Although it is acknowledged that recruitment of such participants may be difficult, any attempts to address this issue would be beneficial. Recruitment inside gambling venues may provide an opportunity for this to occur.

The current study targeted electronic gaming machine (EGM) players and excluded those who took part in multiple types of gambling. As such the findings are applicable to those who only play gaming machines; however, different forms of gambling are considered to be undertaken for different motivational reasons (Griffiths & Delfabbro, 2001). The current studies also highlighted the potential of the pathways model of problem gambling put forward by Blaszczynski and Nower (2002) in the identification of subgroups in a sample of EGM players. In order to generalise the findings of these studies to other types of gambling, and to provide further support for the pathways model, it will be necessary to test the current findings using samples of problem gamblers who engage in a variety of gambling forms.

The identification of three factors with characteristics corresponding to those of the three subgroups hypothesised by Blaszczynski and Nower (2002) in their pathways model, shows promise for gaining a better understanding of the progression from regular to problem gambling within each subgroup. The empirical testing of this model with a sample of regular non-problem gamblers could provide important insights into the development of problem gambling and the differences in development for each subtype.

Treatment for problem gambling is likely to be enhanced by the identification of subgroups of problem gamblers, each with their own specific treatment needs. In order to be able to apply reversal theory to these subgroups in a way that will assist with treatment, it will be necessary to identify state changes across a gambling episode. Techniques using technology such as mobile telephones and electronic diaries such as those described by Gee, Coventry and Birkenhead (2005) and O'Connell et al. (2000) provide an opportunity to gain information about motivational state changes as close as possible to, or during, a gambling episode. This type of data would also be able to be applied to lapse and relapse gambling situations, enabling tailored, individual strategies to be developed based around motivational state changes. For example, interventions to target lapses while in a telic state may include reminders about negatives of gambling and positives of abstaining, or relaxation techniques; whereas interventions that target lapses occurring in the paratelic state may include social activity or physical activity which is deemed exciting.

Conclusions

The study identified important differences between problem, regular and non-gamblers on reversal theory and personality measures. These findings could change conceptual views of gambling and contribute to the development of new treatment approaches. Furthermore, this study provided empirical support for the presence of different factors within a sample of gamblers. Interpretation of these factors lends support for the classification of problem gamblers into subgroups based on the pathways model of problem gambling proposed by Blaszczynski and Nower (2002).

Further investigation is warranted into reversal theory and the motivational state changes that accompany gambling behaviour across different subgroups of problem gamblers and using differing forms of gambling. This type of information would provide a better understanding of the psychological processes and predispositions that establish and maintain gambling behaviour and addiction. This would also allow for targeted interventions that focus on motivational state changes and their influence on gambling behaviour.

References

Adkins, B.J., Kruedelbach, N.G., Toohig, T.M., & Rugle, L.J. (1987). The relationship of gaming preferences to MMPI personality variables. Cleveland Veterans Administration Medical Center, Brecksville Unit, Brecksville, OH.

Allcock, C.C., & Grace, D.M. (1988). Pathological gamblers are neither impulsive nor sensation-seekers. *Australian and New Zealand Journal of Psychiatry, 20,* 259-265.

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders: DSM-IV* (4th ed.). Washington, DC: Author.

Anderson, G., & Brown, R.I.F. (1984). Sensation seeking and arousal in real and laboratory gambling. *British Journal of Psychology, 85,* 401-410.

Anderson, G., & Brown, R.I.F. (1987). Some applications of reversal theory to the explanation of gambling and gambling addictions. *Journal of Gambling Behaviour, 3,* 179-189.

Apter, M.J. (1982). *The experience of motivation: The theory of psychological reversals.* London: Academic Press.

Apter, M.J. (1989). *Reversal Theory: Motivation, Emotion and Personality.* London and New York: Routledge.

Apter, M.J. (2001). An Introduction to Reversal Theory Motivational Styles in Everyday Life. In M.J. Apter (Ed.), Washington, DC: American Psychological Association.

Apter, M.J., Mallows, R., & Williams, S. (1998). The development of the Motivational Style Profile. *Personality and Individual Differences, 24*, 7-18.

Battersby, M., Thomas, L., Tolchard, B., & Esterman, A. (2002). The South Oaks Gambling Screen : A review with reference to Australian use. *Journal of Gambling Studies, 18(3),* 257-271.

Bechara, A. (2003). Risky business: Emotion, decision-making, and addiction. *Journal of Gambling Studies, 19(1),* 23-51.

Bergler, E. (1957). *The psychology of the gambler.* New York, NY: International University Press.

Blaszczynski, A., & McConaghy, N. (1987). Demographic and clinical data on compulsive gambling. In M. Walker (Ed.), *Faces of Gambling* (pp. 262-272). Sydney: National Association of Gambling Studies.

Blaszczynski, A., & McConaghy, N. (1989). Anxiety and/or depression in the pathogenesis of addictive gambling. *The International Journal of the Addictions, 24,* 337-350.

Blaszczynski, A. P., & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction, 97(5),* 487-499.

Blaszczynski, A., & Steel, Z. (1998). Personality disorders among pathological gamblers. *Journal of Gambling Studies, 14(1),* 51-71.

Blaszczynski, A., Steel, Z., & McConaghy, N. (1997). Impulsivity in pathological gambling: The antisocial impulsivist. *Addiction, 92,* 75-87.

Blaszczynski, A., Winter, S.S., & McConaghy, N. (1986). Sensation seeking and pathological gambling. *Journal of Gambling Behaviour, 2*, 3-14.

Breen, R.B., & Zimmerman, M. (2002). Rapid onset of pathological gambling in machine gamblers. *Journal of Gambling Studies, 18(1),* 31-43.

Breen, R.B., & Zuckerman, M. (1999). Chasing in gambling behaviour: Personality and cognitive determinants. *Personality and Individual Differences, 27(6),* 1097-1111.

Brown, R.I.F. (1986). Arousal and sensation-seeking components in the general explanation of gambling and gambling addictions. *International Journal of the Addictions, 21,* 1001-1016.

Brown, R.I.F. (1987). Models of gambling and gambling addictions as perceptual filters. *The Journal of Gambling Behaviour, 3(4),* 224-236.

Brown, R.I.F. (1988). Reversal theory and subjective experience in the explanation of addiction and relapse. In M.J. Apter, J.H. Kerr & M.P Cowles (Eds.), *Progress in reversal theory* (pp. 191-212). Amsterdam: Elsevier.

Brown, R.I.F. (1989). Relapses from a gambling perspective. In M. Gossop (Ed.), *Relapse and addictive behaviour.* Great Britain: Billing and Sons Ltd.

Brown, R.I.F. (1991). Gambling, gaming and other addictive play. In J.H. Kerr & M.J. Apter (Eds.), *Adult play: A reversal theory approach* (pp. 101-118). Amsterdam: Swets & Zeitlinger B.V.

Brown, R.I.F. (2001). Addictions. In Apter, M.J. (Ed.) *Motivational Styles in Everyday Life: A Guide to Reversal Theory.* Washington, D.C.: American Psychological Association.

Brown, G.L., & Linniola, M.I. (1990). CSF serotonin metabolite (5-HIAA) studies in depression, impulsivity and violence. *Journal of Clinical Psychiatry, 51,* 31-41.

Chantal, Y., & Vallerand, R.J. (1996). Skill versus luck: A motivational analysis of gambling involvement. *Journal of Gambling Studies, 12(4)*, 407-418.

Clarke, D. (2004). Impulsiveness, locus of control, motivation and problem gambling. *Journal of Gambling Studies, 20(4),* 319-345.

Coman, G.J., Burrows, G.D., & Evans, B.J. (1997). Stress and anxiety as factors in the onset of problem gambling: Implications for treatment. *Stress Medicine, 13*, 235-244.

Coventry, K.R., & Brown, R.I.F. (1993). Sensation seeking, gambling and gambling addictions. Addiction, 88, 541-554.

Coventry, K.R., & Constable, B. (1999). Physiological arousal and sensation seeking in female fruit machine gamblers. *Addiction, 96*, 425-430.

Crockford, D.N., & el-Guebaly, N. (1998). Psychiatric comorbidity in pathological gambling: A critical review. Canadian Journal of Psychiatry, 43, 43-50.

Delfabbro, P., Grabosky, P., Lahn, J. (2005). Adolescent gambling in the ACT. Report to the ACT Gambling and Racing Commission, ANU Centre for Gambling Research, Canberra, ACT.

Dickerson, M. (1991). Comment on "The earnest approach to problem betting", *Journal of Gambling Studies, 7,* 181-183.

Dickerson, M. (1993). Internal and external determinants of persistent gambling: Problems in generalising from one form to another. *Journal of Gambling Studies, 9(3)*, 225-245.

Dickerson, M., Baron, E., Hong, S.M., & Cottrell, D. (1996). Estimating the extent and degree of gambling related problems in the Australian population: A national survey. *Journal of Gambling Studies, 12,* 161-178.

Dickerson, M., Hinchy, J., & Fabre, J. (1987). Chasing, arousal, and sensation seeking in off-course gamblers. *British Journal of Addiction, 82,* 673-680.

Dowling, N., Smith, D., & Trang, T. (2005). Electronic gaming machines; Are they the 'crack-cocaine' of gambling? *Addiction, 100(1),* 33-45.

Duong, T., & Ohtsuka, K. (1999). *Vietnamese Australian Gamblers' views on luck and winning: A preliminary report.* Paper presented at the 9th National Association of Gambling Studies Conference. Gold Coast, Queensland, Australia.

Echeburúa, E., Fernández-Montalvo, J. (2005). Psychological Treatment of Slot-Machine Pathological Gambling: New Perspectives. *Journal of Gambling Studies, 21(1),* 21-26.

Eysenck, H.J., & Eysenck, S.B.J. (1991). *Manual of the Esyenck Personality Scales (EPS Adult).* London: Hodder & Stoughton.

Eysenck, S., Pearson, P., Easting, G., & Allsopp, J. (1985). Age norms for impulsiveness, venturesomeness and empathy in adults. *Personality and Individual Differences, 6,* 613-619.

Ferris, J., Wynne, H., & Single, E. (1999). *Measuring problem gambling in Canada: Final report-phase 1, Inter-provincial task force on problem gambling,* report submitted for the Canadian Centre on Substance Abuse.

Freud, S. (1928). Dostoevsky and parricide. *The standard edition of the complete works of Sigmund Freud.* J. Starchey (Ed. And translator), *21,* 222-242.

Frey, K.P. (1997). About reversal theory. In S. Svebak & M.J. Apter (Eds.), *Stress and health: A reversal theory perspective* (pp. 3-19). Washington, DC: Taylor & Francis.

Frey, K.P. (1999). Reversal theory: Basic concepts. In J.H. Kerr (Ed.), *Experiencing sport: Reversal theory* (pp. 3-36). Chichester: John Wiley & Sons.

Gee, P., Coventry, K.R., & Birkenhead, D. (2005). Mood states and gambling: Using mobile telephones to track emotions. *British Journal of Psychology, 96,* 53-66.

Gilovich, T. (1983). Biased evaluation and persistence in gambling. *Journal of Personality and Social Psychology, 44,* 1110-1126.

Griffiths, M.D. (1993). Tolerance in gambling: An objective measure using the psychophysiological analysis of male fruit machine gamblers. Addictive Behaviours, 18, 365-372.

Griffiths, M.D. (1994). The role of cognitive bias and skill in fruit machine gambling, British Journal of Psychology, 85: 351-369.

Griffiths, M., & Delfabbro, P. (2001). The biopsychosocial approach to gambling: Contextual factors in research and clinical interventions. *eGambling: The Electronic Journal of Gambling Issues, 5.* Retrieved February 15, 2003 from http://www.camh.net/egambling/archive/pdf/EJGI-issue5/EJGI-issue5-complete.pdf

Gupta, R. (1997). *Toward testing a general theory of addictions: An examination of gambling, risk-taking and related personality variables in adolescents.* Unpublished doctoral dissertation, Department of Educational and Counselling Psychology, McGill University, Montreal.

Hebb, D.O. (1955). Drives and the C.N.S. (Conceptual Nervous System). *Psychological Review, 11,* 243-254.

Herman, R. D. (1976). Motivations to gamble: The model of Roger Caillois. In W. R. Eadington (Ed.), *Gambling and society* (pp. 207-217). Springfield, IL: Thomas.

Ibáñez, A., Blanco, C., Castro, I.P., Fernandez-Piqueras, J., & Sáiz-Ruiz, J. (2003). Genetics of pathological gambling. *Journal of Gambling Studies, 19(1)*, 11-22.

Ibáñez, A., Blanco, C., & Sáiz-Ruiz, J. (2002). Neurobiology and genetics of pathological gambling. *Psychiatric Annals, 32(3),* 181-185.

Jacobs, D.F. (1986). A general theory of addictions: A new theoretical model. *Journal of Gambling Behaviour, 2,* 15-31.

Jacobs, D.F. (1988). Evidence for a common dissociative-like reaction among addicts. *Journal of Gambling Behaviour, 4(1)*, 27-37.

Jacobs, D.F. (1989). A general theory of addictions: Rationale for and evidence supporting a new approach for understanding and treating addictive behaviours. In H.J. Shaffer, S.A. Stein, B. Gambino and T.N. Cummings (Eds.), *Compulsive gambling: Theory, research and practice* (pp.37-64).USA: Lexington.

Kaiser, J.F. (1974). An index of factorial simplicity. *Psychometrika, 39*, 31-36.

Knapp, T.J. (1976). A functional analysis of gambling behaviour. In W.R. Eadington (Ed.), *Gambling and Society* (pp. 276-294). Charles C. Thomas: Springfield, Illanois.

Lesieur, H.R. (1984). *The Chase: Career of the Compulsive Gambler (2nd ed.).* Rochester, Vermont: Schenkman Books Inc.

Lesieur, H.R., & Blume, S.B. (1987). The South Oaks Gambling Screen (SOGS): A new instrument for the identification of pathological gamblers. *American Journal of Psychiatry, 144(9),* 1184-1188.

Lesieur, H.R., Blume, S.B., & Zoppa, R.M. (1986). Alcoholism, drug abuse, and gambling. *Alcoholism, Clinical and Experimental Research, 10(1),* 33-38.

Lesieur, H.R., & Rosenthal, R.J. (1991). Pathological gambling: A review of the literature. *Journal of Gambling Studies, 7(1),* 5-39.

Lo, R., & Anjoul, F. (2001). Personality predispositions to gambling. *Journal of Gambling Studies, 13(2),* 19-27.

Maxwell, S.E. & Delaney, H.D. (1990). *Designing experiments and analyzing data: A model comparison perspective.* Belmont, CA: Wadsworth.

McConaghy, N., Armstrong, M., Blaszczynski, A., & Allcock, C. (1988). Beahvioural completion versus stimuls control in compulsive gambling. *Behavioural Modification, 12(3),* 371-384.

McCormick, R.A., Taber, J., Kruedelbach, N., & Russo, A. (1987). Personality profiles of hospitalized pathological gamblers: The California Personality Inventory. *Journal of Clinical Psychology, 43,* 521-527.

McCorriston, T. (1999). Commentary: Australian Psychological Society position paper on psychological aspects of gambling behaviour. *Australian Psychologist, 34* (1), 17–19.

McMillen, J.(1997). Social priorities in gaming policy. Case studies from two Australian states', in W. Eadington and J.Cornelius (Eds.), *Public Policy, The Social Sciences and Gambling.* Institute for the Study of Gambling and Commercial Gaming, University of Nevada, pp.103-126.

Miller, W.R. (1985). Addictive behaviour and the theory of psychological reversals. *Addictive Behaviours, 10,* 177-180.

Moodie, C., & Finnigan, F. (2005). A comparison of the autonomic arousal of frequent, infrequent and non-gamblers while playing fruit machines. *Addiction, 100(1),* 51-59.

Moore, S. M., Ohtsuka, K. (1997). Gambling activities of young Australians: Developing a model of behaviour. *Journal of Gambling Studies, 13*, 207-236.

Moreno, I., Saiz-Ruiz, J. & Lopez-Ibor, J.J. (1991). Serotonin and gambling dependence. *Human Psychopharmacology, 6,* 9-12.

Moreyra, P., Ibáñez, A., Leibowitz, M.R., Sáiz-Ruiz, J., & Blanco, C. (2002). Pathological gambling: Addiction or obsession? *Psychiatric Annals, 32(3),* 161-166.

Morton, A. (1996). *Effects of winning and losing on physiological and psychological processing during gambling.* Unpublished honour's thesis, University of Tasmania, Tasmania, Australia.

Murgatroyd, S., Rushton, C., Apter, M.J., & Ray, C. (1978). The Telic Dominance Scale. In M.J. Apter, J.H. Kerr, & P. Cowles (Eds.), *Progress in reversal theory* (pp. 365-368). New York: Elsevier.

O'Connell, K.A., Cook, M.R., Gerkovich, M.M., Potocky, M., & Swan, G.E. (1990). Reversal theory and smoking: A state-based approach to ex-smokers' highly tempting situations. *Journal of Consulting and Clinical Psychology, 58,* 489-494.

O'Connell, K.A., Gerkovich, M.M., Bott, M., Cook, M.R, & Shiffman, S. (2000). Playfulness, arousal-seeking and rebelliousness during smoking cessation. *Personality and Individual Differences, 29,* 671-683.

O'Connell, K.A., & Gerkovich, M.M., & Cook, M.R. (1995). Reversal theory's mastery and sympathy states in smoking cessation. *Journal of Nursing Scholarship, 27(4),* 311-316.

O'Connell, K.A., & Martin, E.J. (1987). Highly tempting situations associated with abstinence, temporary lapse, and relapse among participants in smoking cessation programs. *Journal of Consulting and Clinical Psychology, 55(3),* 367-371.

Petry, N. M. (2001). Substance abuse, pathological gambling, and impulsiveness. *Drug and Alcohol Dependence, 63,* 29-38.

Potenza, M.N., Steinberg, M.A., McLaughlin, S.D., Wu., R., Rounsaville, B.J., & O'Malley, S.S. (2000). Illegal behaviors in problem gambling: Analysis of data from a gambling helpline. *The Journal of the American Academy of Psychiatry and the Law*, 28(4), 389-403.

Productivity Commission. (1999). *Australia's Gambling Industries,* Report No. 10, AusInfo, Canberra.

Reversal Theory Society Website. http://www.reversaltheory.org.au

Rosecrance, J. (1986). Why regular gamblers don't quit: A sociological perspective. *Sociological Perspectives, 29(3),* 357-378.

Rule, B. G., & Fisher, D.G. (1970). Impulsivity, subjective probability, cardiac response and risk taking: correlates and factors. *Personality, 1,* 251-260.

Scheier, M. F., & Carver, C. S. (1985). Optimism, coping and health: Assessment and implications of generalized outcome expectancies. *Health Psychology, 4,* 219-247.

Shaffer, H.J., Hall, M.N., & Vander Bilt, J., (1999). Estimating the prevalence of disordered gambling in the United States and Canada: A research synthesis. *American Journal of Public Health, 89(9),* 1369-1376.

Sharpe, L. (2002). A reformulated cognitive-behavioural model of problem gambling: A biopsychosocial perspective. *Clinical Psychology Review, 22,* 1-25.

Sharpe, L. (2004). Patterns of autonomic arousal in imaginal situations of winning and losing in problem gambling. *Journal of Gambling Studies, 20(1),* 95-104.

Sharpe, L., Walker, M., Coughlan, M., Enerson, M., & Blasczcynski, A. (2005). Structural changes to electronic gaming machines as effective harm minimisation strategies for non-problem and problem gamblers. *Journal of Gambling Studies, 21(4),* 503-520.

Steel, Z., & Blazczynski, A. (1998). Impulsivity, personality disorders and pathological gambling severity. *Addiction, 93(6),* 895-905.

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics* (3rd ed.). New York: Harper Collins.

Tolchard, T.B., & Battersby, M. (2000). Nurse behavioural psychotherapy and pathological gambling: An Australian perspective. *Journal of Psychiatric and Mental Health Nursing, 7,* 335-342.

Vasey, M.W., Thayer, J.F. (1987). The continuing problem of false positives in repeated measures ANOVA in psychophysiology: A multivariate solution. *Psychophysiology, 24*, 479-486.

Walker, M.B. (1992). *The psychology of gambling.* Oxford: Pergamon Press.

Wildman, R.W. (1998). *Gambling: An attempt at an integration.* Canada: Wynne Resources.

Williams, A. (1996). *Gambling: A family affair.* London: Sheldon Press.

Wolfgang, A.K. (1988). Gambling as a function of gender and sensation seeking. *Journal of Gambling Behaviour, 4,* 71-77.

World Health Organisation (2006). International Classification of Diseases, 10th revision, version for 2006. Accessed at http://www3.who.int/icd/currentversion/fr-icd.htm

Wykes, A. (1964). *Gambling.* London, UK: Spring Books.

Zuckerman, M., Kohlman, D. M., Joireman, J., Teta, P., & Kraft, M. (1993). A comparison of three structural models for personality: The big three, the big five, and the alternative five. Journal of Personality and Social Psychology, 65, 757-768.

Appendix A

Forms

UNIVERSITY
OF TASMANIA

School of Psychology

Statement of Informed Consent

Factors Involved in Gambling Behaviour

I have read and understood the information sheet for this study. The nature and possible effects of the study have been explained to me. I understand that the study involves the completing a number of questionnaire measures.

Any questions that I have asked have been answered to my satisfaction.

I agree to participate in this investigation and understand that I may withdraw at any time without affecting my use of the BreakEven Gambling Services (where applicable) or without loss of course credit or any affect to my academic standing (for those within the University).

I agree that the research data gathered from this study may be published provided that I cannot be identified as a subject.

Your Name .....

Signature .....

Date .....

Phone .....

❑ Please tick this box if you do not wish to be contacted for any future follow up studies

NB. This page will be removed and kept separate from your questionnaire data

Private Bag 30 Hobart
Tasmania Australia 7001
Telephone (03) 6226 2237
Facsimile (03) 6226 2883

UNIVERSITY OF TASMANIA

School of Psychology

Factors Involved in Gambling Behaviour

Investigators: Anna Dimsey & Dr George Wilson

This study is being undertaken as a requirement of the PhD program in Clinical Psychology. The purpose of this study is to investigate the factors underlying gambling behaviour.

As a participant you will be asked to fill out a number of questionnaires related to gambling, other behaviours and attitudes. Completion of these questionnaires is expected to take about one hour.

Participation in this study is entirely voluntary and you may withdraw from the study at any time without prejudice. The study is not part of the BreakEven gambling services program and participation will not affect your continued use of these services in any way (if applicable). Participants from the first year Psychology program will be awarded course credit for their participation.

All information collected will be kept secure and confidential at all times. Identifying information will be destroyed following the completion of the project and you will not be identified in any subsequent use of the results. A summary of results will be distributed to involved agencies and if you would like an individual copy, this can be provided on request.

This project has received approval from the University of Tasmania Human Research Ethics Committee. If you have any concerns of an ethical nature you may contact the Chair of the Committee on 6226 2763. If you have any concerns or questions about this study, now or in the future please contact Anna Dimsey or Dr George Wilson on 6226 2886. Alternatively you can email: Anna.Dimsey@utas.edu.au.

Please remove this sheet so that is available should you wish to contact us in the future.

GPO Box 252-30 Hobart
Tasmania Australia 7001
Telephone (03) 6226 2237
Facsimile (03) 6226 2883

Appendix B

Gambling Behaviour Questionnaire

Please <u>circle</u> the appropriate answer or place a <u>tick</u> next to the box that matches your response:

Year of Birth: .....

Age: < 18yrs 18-24yrs 25-34yrs 35-50yrs 51yrs+

Gender: Male Female

Marital Status: Never Married
Married
Separated
Divorced
Other (please detail) .....

Highest Level of Education:
Primary School
High School
College (grades 11& 12)
Trade Certificate
Diploma
Degree
Higher Degree
Other (please detail) .....

Current Occupation or source of income: .....

Gross Annual Income (how much you earn a year before tax):
< $15,000 $ 15-25,000 $ 25-40,000 $ 40-50,000 $ 50,000+

Age Commenced Gambling:
<18yrs 18-24yrs 25-34yrs 35-50yrs 51yrs+

Duration of Problem Gambling:
N/A 1-12 months 1-2yrs 2-4yr 5-10yrs 10yrs+

Normally, how often would you gamble:
daily weekly monthly less other.....

How long would you gamble for each session (hrs): .....

What types of gambling do you participate in? (tick all that apply)

- ☐ lottery tickets/keno
- ☐ scratchies
- ☐ betting on horses/dogs at the track
- ☐ betting at the TOTE
- ☐ electronic gaming machines (pokies)
- ☐ casino games (eg. blackjack, roulette)
- ☐ other (please detail).....

Which type of gambling do you take part in most often?

.....

Normally, how often would you have a drink containing alcohol:

daily weekly monthly less other.....

How many standard drinks would you have on any one occasion:

10+ 7-9 5-6 3-4 1-2

Do you smoke cigarettes: yes no

Do you use any drugs (other than prescribed medicines) yes no

If yes, please list:

.....

.....

.....

.....

How often would you use drugs:

daily weekly monthly less other

Are there any activities or interests that you find take up a lot of your time:

yes no

If yes, please describe:

.....

.....

.....

.....

How many hours per week would you spend normally spend on each of these activities or interests:

.....

.....

.....

.....

Do you find that once you get interested in something it takes up a lot of your time: yes no

Have your friends or family ever thought you spent too much time on an activity:
yes no

If yes, please describe:
.....
.....
.....
.....

Have you ever found it difficult to give up doing something? yes no
If yes, please describe:
.....
.....
.....
.....

At the current time are you:

☐ Currently seeking help for your gambling

☐ Currently self-excluded from gaming venues

☐ Currently Gambling

☐ Not Currently Gambling (how long since you last gambled ?.....)

Have you ever felt as though you were addicted to anything, or couldn't give something up? (not gambling)

☐ Yes – please specify type of activity (eg. smoking, internet, exercise), when (year) and for how long (number of years/months).

.....
.....
.....
.....

☐ No

Have you ever sought treatment for any other addiction?

☐ Yes – If yes please specify activity and date

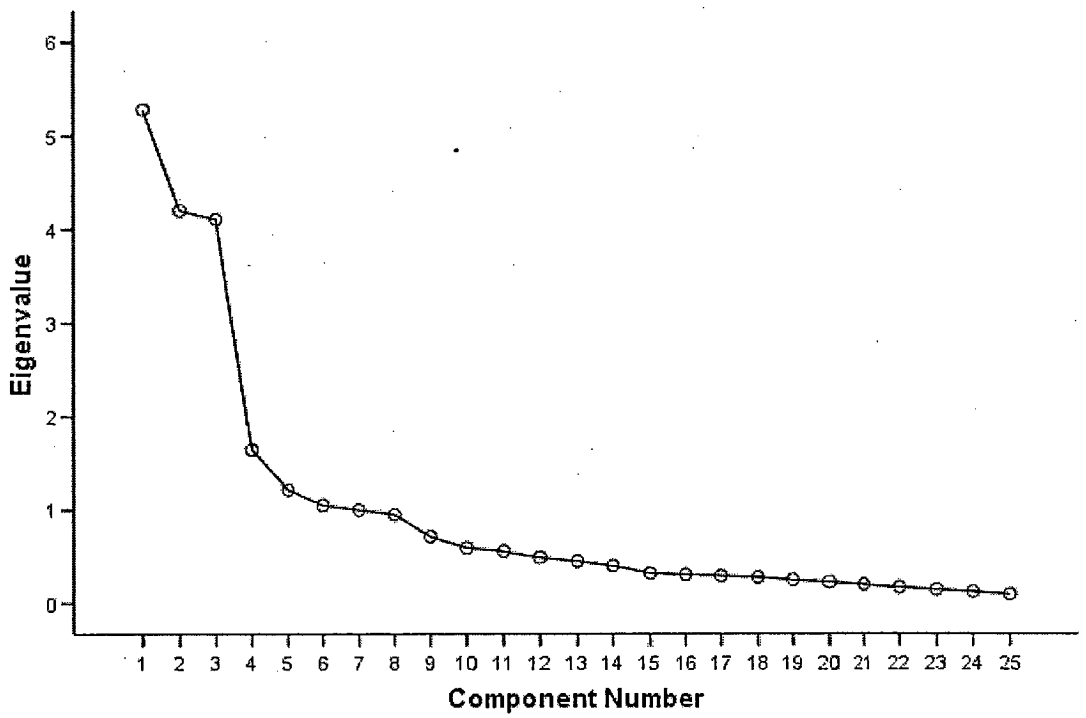
.....
.....
.....
.....

☐ No

Appendix C

Study 3 Exploratory Factor Analysis Additional Data

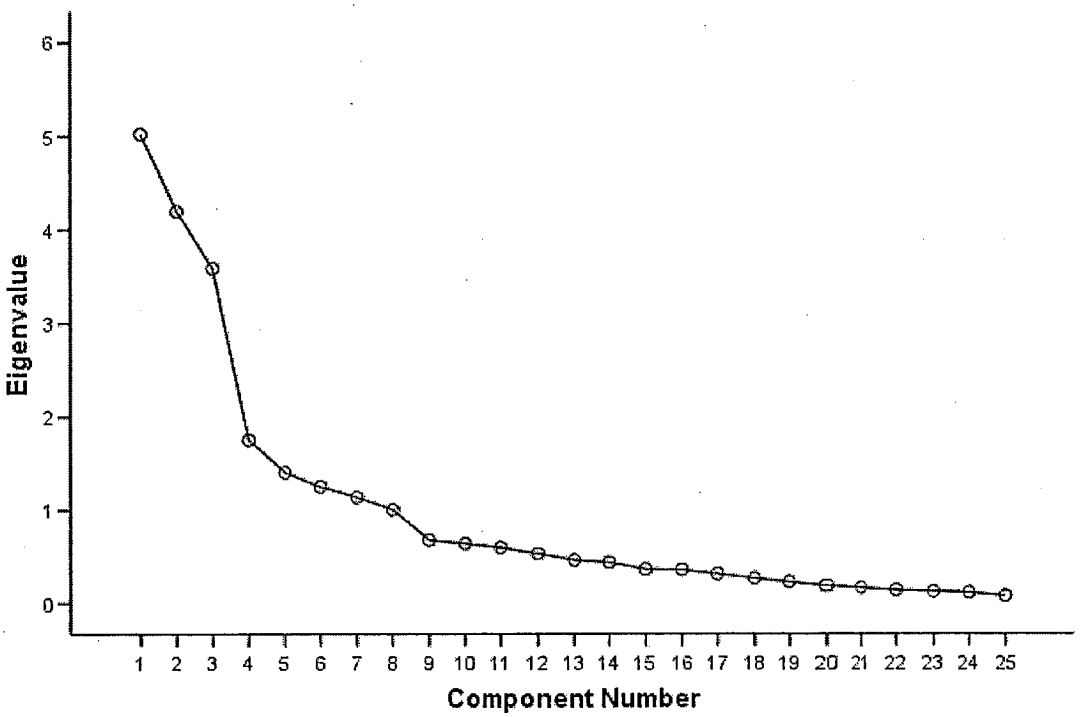
Appendix C1. Scree Plot for Principal Components Analysis: Regular, Problem and Non-Gambling Groups combined



Appendix C2. Unrotated Factor Solution for Principal Components Analysis: Regular, Problem and Non-Gambling Groups Combined (-- = loading < .30)

Variables	Factor 1	Factor 2	Factor 3
Age	--	--	--
Hours per month	-.35	--	.32
SOGS	--	-.35	.58
Impulsive/Sensation Seeking (ZKPQ)	.52	-.55	--
Neuroticism/Anxiety (ZKPQ)	--	--	.86
Agresssion/Hostility (ZKPQ)	--	-.36	.49
Activity (ZKPQ)	.42	--	--
Sociability (ZKPQ)	.65	--	--
Seriousness (MSP)	.43	.68	--
Playfulness (MSP)	.81	--	--
Arousal Avoiding (MSP)	--	.79	--
Arousal Seeking (MSP)	.78	-.35	--
Defiant (MSP)	.51	-.47	--
Compliant (MSP)	--	.70	--
Self-centred Mastery (MSP)	.67	--	--
Self-centered Sympathy (MSP)	.36	--	.52
Other-centered Mastery (MSP)	.54	.48	--
Other-centered Sympathy (MSP)	.42	.52	--
Optimism (MSP)	.75	--	-.37
Pessimism (MSP)	--	--	.82
Emotionality (MSP)	--	--	.77
Effortfulness (MSP)	.63	.42	--
Impulsivity (I7)	.33	-.49	.54
Venturesomeness (I7)	.44	-.58	--
Empathy (I7)	--	.31	.57
Eigenvalue	5.28	4.20	4.10
Variance Accounted for	21.11%	16.80%	16.42%

Appendix C3. Scree Plot for Principal Components Analysis: Regular and Problem Gambling Groups Combined



Appendix C4. Unrotated Factor Solution for Principal Components Analysis: Regular and Problem Gambling Groups Combined (-- = loading < .30)

Variables	Factor 1	Factor 2	Factor 3
Age	--	.31	--
Hours per month	.40	--	--
SOGS	.40	--	.53
Impulsive/Sensation Seeking (ZKPQ)	.58	-.54	.21
Neuroticism/Anxiety (ZKPQ)	--	.54	.68
Agresssion/Hostility (ZKPQ)	--	--	.51
Activity (ZKPQ)	.42	--	-.41
Sociability (ZKPQ)	.54	.35	--
Seriousness (MSP)	.37	.45	-.60
Playfulness (MSP)	.68	-.42	--
Arousal Avoiding (MSP)	--	.76	--
Arousal Seeking (MSP)	.58	-.55	--
Defiant (MSP)	.41	-.38	--
Compliant (MSP)	.43	.58	--
Self-centred Mastery (MSP)	.54	--	--
Self-centered Sympathy (MSP)	.56	--	.43
Other-centered Mastery (MSP)	.59	.34	-.40
Other-centered Sympathy (MSP)	.52	.40	--
Optimism (MSP)	.56	--	-.54
Pessimism (MSP)	--	.38	.60
Emotionality (MSP)	.46	.48	.35
Effortfulness (MSP)	.57	--	-.54
Impulsivity (I7)	.54	-.32	.47
Venturesomeness (I7)	--	-.69	--
Empathy (I7)	.32	.45	.39
Eigenvalue	5.02	4.20	3.59
Variance Accounted for	20.10%	16.79%	14.34%